

CardioSys/MicroLab

Servicing Instructions

Version 4.x

227 436 37 SA(e)

Revision B



marquette

A GE Medical Systems Company

Caution:

During repairs/service interventions, observe the protective measures against damage due to ESD.

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 - assembly operations, extensions, readjustments, modifications, or repairs are carried out by Marquette Hellige GmbH or by persons authorized by Marquette Hellige GmbH,
 - the electrical installation of the relevant room complies with the applicable national and local requirements, and
 - the instrument is used in accordance with the instructions for use.
- * This manual contains service information; operating instructions are provided in the user manual of the instrument.
- * This manual is in conformity with the instrument at printing date.
- * All rights are reserved for instruments, circuits, techniques, and names appearing in the manual.

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REFERENCES

| Reference | Document Title |
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| [SA(e)] | Servicing Instructions CardioSys V3.0, 227 436 35A |

REVISION HISTORY

| Date | Version | Author | Remarks |
|----------|---------|-----------------|------------------------------------|
| 17.03.99 | V 1.0 | T.Eberle | Creation for CardioSys V4.1 |
| 08.04.99 | V 1.1 | K.H.Ruh | Update |
| 30.04.99 | V1.2 | W.Waltersberger | Hardware issues and general rework |
| 25.02.00 | V1.3 | W.Waltersberger | Update; ECO 064158 |

1 General information

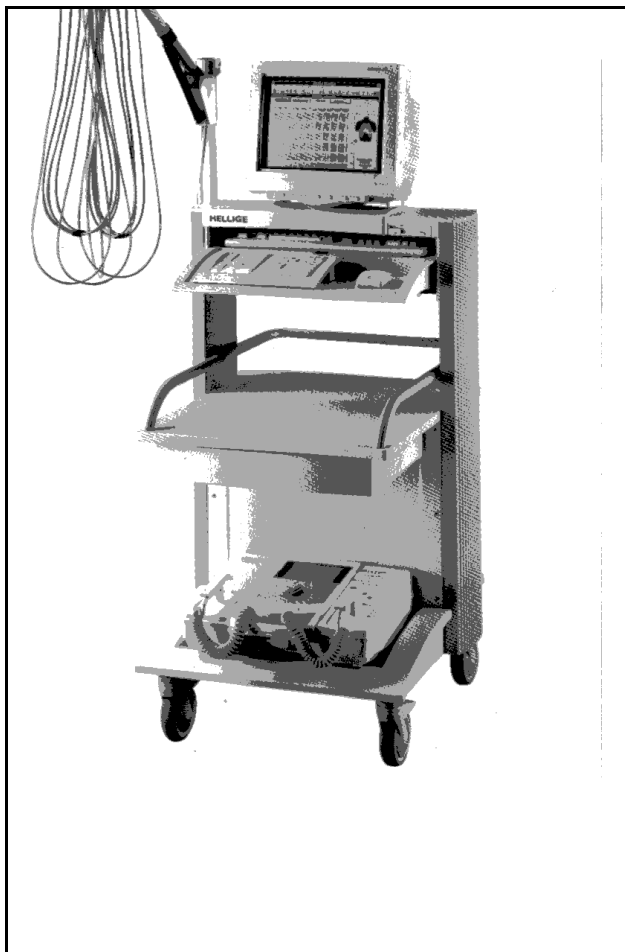
CardioSys is a complete ECG recording and processing system comprising the following components:

- * instrument cart with integrated CORINA and PC
- * monitor
- * standard keyboard
- * mouse

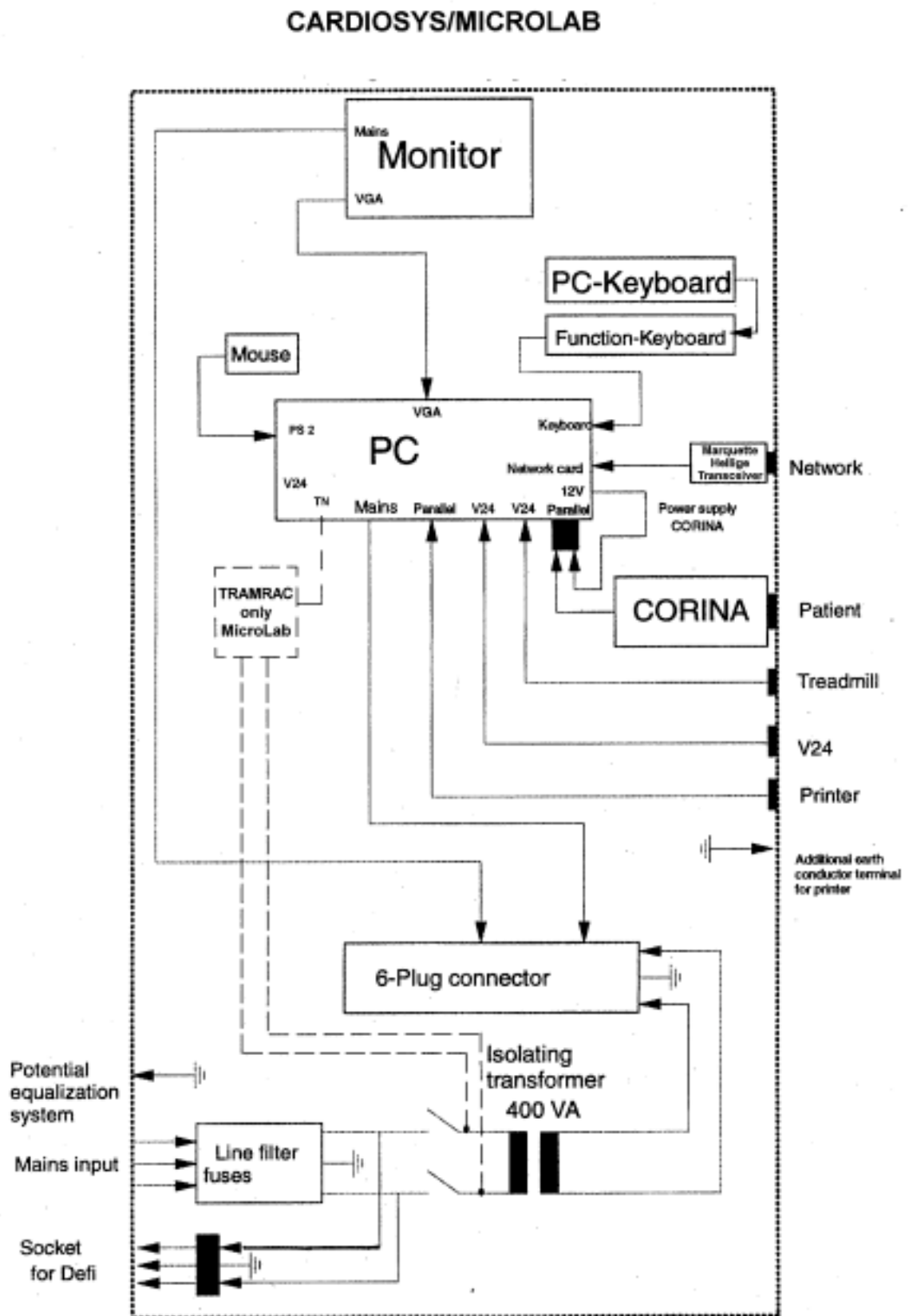
optional:

- * function key keyboard
- * printer
- * electrode application system
- * respiratory flow sensor
- * network option
- * streamer
- * MO drive

Instrument design:



2 Block diagram



3 Functional description

3.1 Electrical components

These comprise all the components which conduct mains voltage. These are:

- mains input
- power on/off switch
- mains socket for defibrillator
- isolating transformer
- internal power distributor

3.1.1 Mains input

The mains input module comprises an IEC plug, the line filter and a fuse holder for two fuses.

- * 230VT 3.15A (5 x 20)
- * 115VT 5A (6.3 x 32)

3.1.2 Power on/off switch

This is a 2-pin power switch which lights up in the ON position.

3.1.3 Mains socket for defibrillator

The defibrillator power supply is tapped off directly behind the mains input. This socket is designed to be compatible with the mains plug-and-socket systems of different countries (world-wide marketing) and USA plug-and-socket system for 115V cart (only CardioSys).

3.1.4 Isolating transformer

The instrument has a built-in isolating transformer to observe the ground leakage current stipulated by the IEC norm. This has a watt rating of approx. 400 VA. Two versions of the isolating transformer are available.

- | | |
|------------|--|
| Version 1: | primary for an input voltage of 115V($\pm 15\%$) 50/60Hz |
| | secondary for an output voltage of 115V |
| Version 2: | primary for an input voltage of 230V($\pm 15\%$) 50/60Hz |
| | secondary for an output voltage of 230V |

- constructed acc. to IEC 601-1 and UL 544
- thermosensitive fusing (120°C)

3.1.5 Internal power distributor

The system cart has an integrated 6-plug connector inserted downline from the isolating transformer. The following devices are connected to this:

- 1 PC subassembly
- 2 Monitor
- 3...6 Free for other devices (e.g., respiratory flow sensor plug-in power supply unit)

Important: in the US model of CardioSys there is a 15-A fuse in the socket board.

3.2 Computer subassembly

3.2.1 Computer subassembly Version 220 108 01

- ATX-Board, 100MHz FSB, 64MB RAM, PII 350 MHz
- 8MB AGP-Video Card
- Interface card (two Serial, one Parallel Interface)
- Floppy
- EIDE-UDMA HDD
- CDROM 32X
- Windows NT 4.0 WS SP3 (Starting with CardioSoft V4.14 : SP4)
- Network card PCI 3COM 3C900-COMBO (optional)
- SCSI card PCI, Fast SCSI Adaptec 2910 (optional)
- MO drive Fujitsu, 640MB(optional)
- DAT-Streamer HP (optional)

3.2.2 Power supply unit

PC power supply unit type Grzelka GP-250 TX* 250W

The PC-power supply unit supplies all PC-components and CORINA.

| | |
|----------------------|--|
| Approval: | VDE 0750 (IEC 601-1), CE European Test Certificate |
| Input voltage range: | 90V...132V, 190V...264V (switchable) |
| Frequency: | 47...63 Hz |
| Watt rating: | 250W |
| Outputs: | + 3,3V max. 14A |
| | + 5V max. 22A |
| | +12V max. 10A |
| | - 5V max 0.3A |
| | -12V max 0.8A |

After switching the Power on/off switch to ON, the STANDBY SWITCH near the disk drive must be used to turn the PC-power supply from standby mode to working mode and back.

3.2.3 CPU card

| | |
|------------|---|
| CPU | Pentium II / 350 |
| cache | 512KB |
| memory | 64 MB DIMM PC-100 |
| interfaces | HDD/FDD EIDE interface, keyboard & mouse interface, 2 serial interfaces, parallel port interface, USB port |
| bus | 2 x ISA, 4 x PCI, 1 x AGP |

3.2.4 SVGA card

| | |
|-------------|---|
| resolution: | 1024x768 for 65536 colors (default configuration) |
| memory: | 8MB SGRAM |
| bus: | AGP |
| output: | 15-pin D-SUB connector (shrunk type) |

3.2.5 Interface card

This card has the following interfaces:

- * two serial interfaces
- * one parallel interface

The serial interfaces can both be busy with different interrupts (IRQ 1 to 15) to enable all interfaces to be used simultaneously.

3.2.6 Hard disk

There is an internal 3½" hard disk.

- * interface: EIDE
- * capacity: min. 3,2 GB

3.2.7 Floppy

There is an internal 3½" (1.44 MB) floppy.

3.2.8 Free slots for upgrading

The free slots offer the possibility to install further interfaces into the PC. These include the following interfaces:

- PCI network card (optional)
- PCI SCSI card (optional)
- AT-Bus TramNet card (MicroLab only)

3.2.9 Network card

An optional PCI Ethernet network card can be installed for network linkup.

bus: PCI
output: BNC, AUI and TP

3.2.10 SCSI card

An SCSI interface card is installed for further drives, e.g., MO drive or streamer.

bus: PCI
interface: Fast SCSI-2

3.2.11 MO drive

An optional MO drive can be installed for storing data externally.

MCB 3064 (Fujitsu)
memory capacity: 640 Mbyte
drive size: 3 ½"

3.2.11.1 Formatting instructions

MO storage media must be formatted before using for the first time.

Fujitsu drive:

Login as "Administrator" and create with Windows Explorer an subdirectory. Use the DISK ADMINISTRATOR (WINNT) to format the 640MB Disks.

There is no possibility to format MO medias without having Administrator rights!!

Formatting Optical Disks

You must have system administrator rights before you can do the following steps! There is no possibility to format MO disks in USER Mode.

Before saving data to an optical disk, the disk must be formatted.

- * Insert the disk.
- * On the Windows screen, select "Start" —> "Programs" —> "Administrative Tools (Common)" —> "Disk Administrator".

The disk administrator displays symbols for the different drives:

drive 0 = hard drive

drive 1 = optical disk (with free storage capacity)

- * Click the "Drive 1" box.
- * In the "Partition" menu select "Create" and confirm the max. storage capacity shown with OK.

The field for drive 1 now says "unformatted xxx MB".

- * In the "Partition" menu, select "Make changes now" and click "OK".

The field for drive 1 now shows the drive letter, e.g. E.

- * Check that the correct drive is selected (drive E in our example), because the formatting process will clear all data on the disk.
- * In the "Options" menu, select "Format".
- * At "File system", select "NTFS".
- * Enter a name for the optical disk.
- * Click "Start" to initiate the formatting process.
- * Click "OK" to confirm the message "All data will be cleared".

Formatting takes about 5 minutes. A progress bar illustrates the process.

- * Click "Close" to end the session.
- * Close the Disk Administrator window.

3.2.12 Streamer DAT

An optional DAT streamer can be installed for data backup.

memory capacity: 2-4 GByte
connection: SCSI-2 interface
drive size: 5 ¼"

3.2.13 TRAM-NET card

(only in the case of Microlab)

PCB TRAM-NET IBM PC INTERFACE 930 117 98

This slot card establishes communication between the PC and Tram-Rac.

3.3 Further components

These components include:

- * keyboard
- * mouse
- * function key keyboard
- * monitor
- * printer

3.3.1 Keyboard

The keyboard is a standard IBM-MFII keyboard with 102 keys.

- * type: CHERRY G81-3000 (5pin DIN or PS/2 connector)

The following country-specific versions are available:

- * German
- * English
- * French
- * Italian
- * Spanish

There is also an optional keyboard with an integrated card reader for the insurance card (private/national health insurance scheme).

- * type: CHERRY G80-1501 (only 5pin DIN connector)

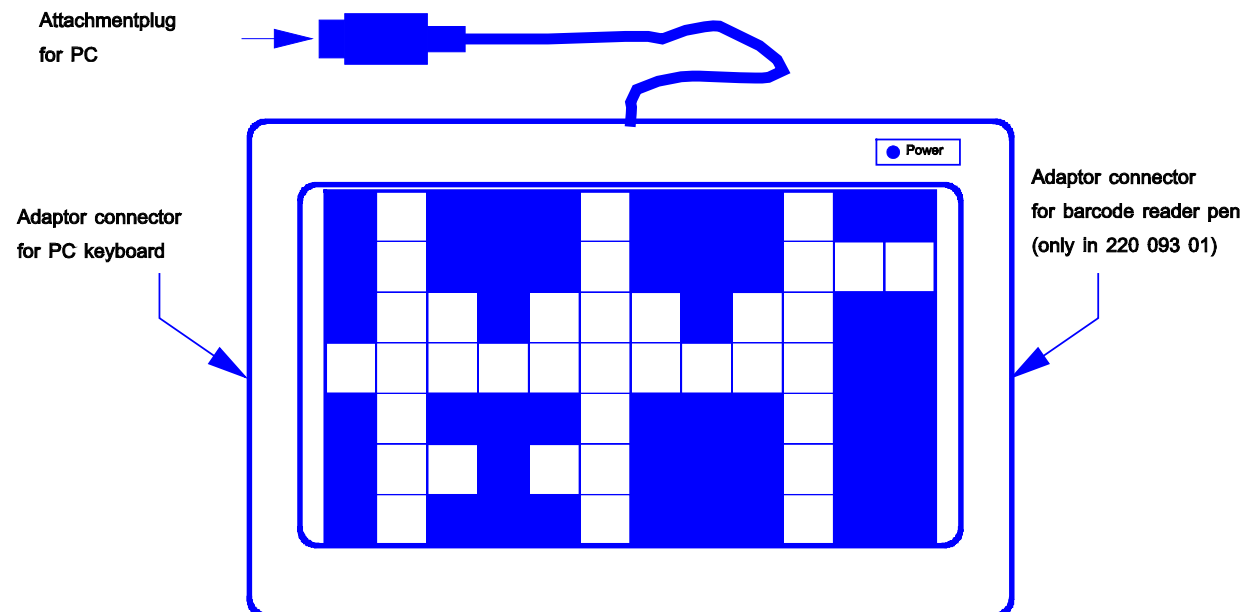
3.3.2 Function key keyboard

The function key keyboard is a special keyboard with keys specifically matched to CardioSys. Two versions are available:

- * function key keyboard standard 220 092 01
 - * function key keyboard with barcode reader 220 093 01
 - * function key keyboard stress 220 092 06
 - * function key keyboard stress with barcode reader 220 093 06
 - * function key keyboard for Microlab 220 092 11
- (the numbers each case refer to the German version)

The following country-specific keyboard labels are available:

- * German, English, French, Italian, Spanish



3.3.3 Mouse

The following mouse is used:

LOGITECH PILOT Mouse PS/2

- * 3 keys

3.3.4 Monitor

A high-resolution 15" or 17" color monitor is used for text and graphics applications with the following specifications:

15" monitor:

- * mains input 110V...120V, 1.9A / 220V...240V, 1.1A (autoswitch)

17" monitor:

- * mains input 110V...120V, 2A / 220V...240V, 1.2A (autoswitch)

- * high-resolution CRT with 0.26 dot pitch
- * approvals TÜV ERGO Trademark (MPR II)
VDE 0871 B
PTB (ZFS)
TÜV GS Trademark (EN 60950)

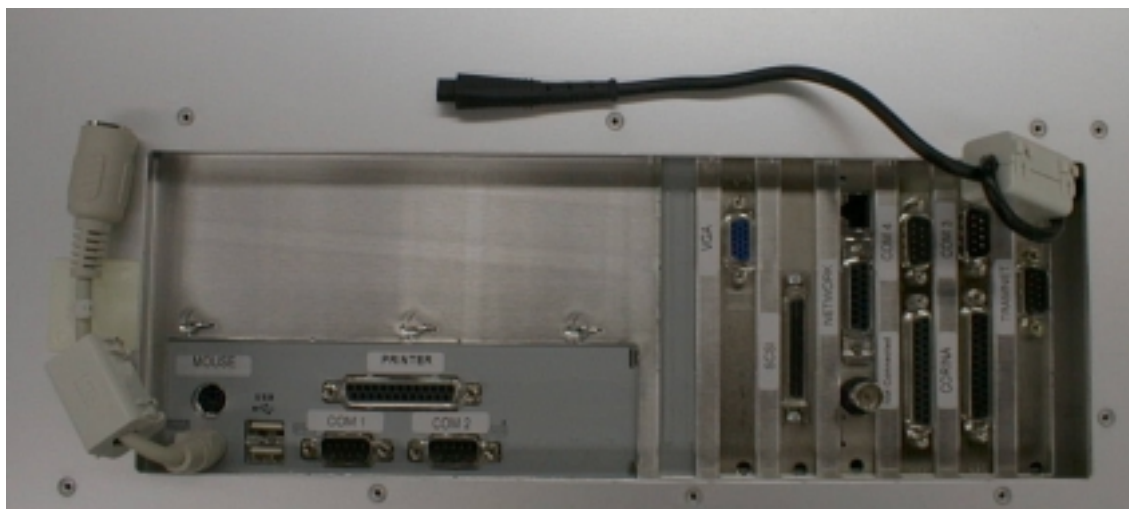
3.3.5 Printer

The norm for electromedical systems dictates that peripherals which have their own power cord and are not approved acc. To IEC 601 may only be connected to electromedical instruments via a floating disconnect or must have an additional non-fused earth conductor terminal.

- * type: EPSON EPL-5700 or HP6P / HP2100

3.4 PC interfaces

These interfaces are located under a lockable flap which can only be opened with the appropriate tool. This flap may only be opened by a member of the technical staff. These interfaces comprise:



- * PS/2 mouse interface
- * keyboard interface
- * monitor interface
- * adaptor connector (COM 1)
- * adaptor connector for ergometer (COM 2)
- * adaptor connector for respiratory flow sensor (COM 3)
- * free serial interface (COM 4)
- * adaptor connector for CORINA (LPT 2)
- * printer port for printer (LPT 1)
- * USB connector and free slots for further peripherals

3.4.1 Keyboard interface

The keyboard interface is a PS/2 interface, adapted by a special cable to a 5-pin DIN connector (adapter lead, cable only used if no PS/2 keyboard) and is a standard interface.

Pin 1 KBCLK

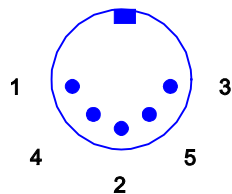
Pin 2 KBDATA

Pin 3-

Pin 4 GND

Pin 5 +5 V

housing shielding



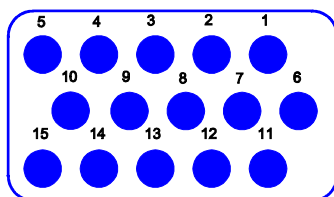
3.4.2 Monitor interface

The monitor interface is in the form of a 15-pin D-SUB connector (shrunk type) and is thus a standard VGA interface.

Pin1 red
Pin2 green
Pin3 blue
Pin4 GND
Pin5 NC

Pin6 red GND
Pin7 green GND
Pin8 blue GND
Pin9 key (no Pin)
Pin10 Synchr. GND

Pin11 monitor ID
Pin12 monitor ID
Pin13 H-Sync
Pin14 V-Sync
Pin15 NC



3.4.3 Mouse/trackball interface

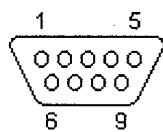
The mouse/trackball interface is P S/2 standard!

3.4.4 Respiratory flow sensor interface

The respiratory flow interface is one of the four serial interfaces. This interface, hereafter designated **COM3**, is a standard serial interface in the form of a 9-pin Subm-D adaptor connector (male).

3.4.5 Ergometer interface

The ergometer interface is one of the four serial interfaces. This interface, hereafter designated **COM2**, is a standard serial interface in the form of a 9-pin Subm-D adaptor connector (male).



(At the Computer)

9 PIN D-SUB MALE at the Computer.

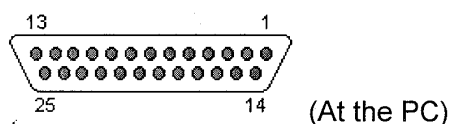
| Pin | Name | Dir | Description |
|-----|------|-----|---------------------|
| 1 | CD | ← | Carrier Detect |
| 2 | RXD | ← | Receive Data |
| 3 | TXD | → | Transmit Data |
| 4 | DTR | → | Data Terminal Ready |
| 5 | GND | — | System Ground |
| 6 | DSR | ← | Data Set Ready |
| 7 | RTS | → | Request to Send |
| 8 | CTS | ← | Clear to Send |
| 9 | RI | ← | Ring Indicator |

3.4.6 Free serial interface

The free serial interface is one of the four serial interfaces. This interface, hereafter designated **COM4**, is a standard serial interface in the form of a 25-pin Subm-D adaptor connector (female).

3.4.7 CORINA interface

The CORINA interface is one of the two parallel interfaces. This interface, hereafter designated **LPT2**, is a standard printer port in the form of a 25-pin Subm-D adapter connector (female).



25 PIN D-SUB FEMALE at the PC.

| Pin | Name | Dir | Description |
|-----|---------|-----|---------------|
| 1 | /STROBE | → | Strobe |
| 2 | D0 | → | Data Bit 0 |
| 3 | D1 | → | Data Bit 1 |
| 4 | D2 | → | Data Bit 2 |
| 5 | D3 | → | Data Bit 3 |
| 6 | D4 | → | Data Bit 4 |
| 7 | D5 | → | Data Bit 5 |
| 8 | D6 | → | Data Bit 6 |
| 9 | D7 | → | Data Bit 7 |
| 10 | /ACK | ← | Acknowledge |
| 11 | BUSY | ← | Busy |
| 12 | PE | ← | Paper End |
| 13 | SEL | ← | Select |
| 14 | /AUTOFD | → | Autofeed |
| 15 | /ERROR | ← | Error |
| 16 | /INIT | → | Initialize |
| 17 | /SELIN | → | Select In |
| 18 | GND | — | Signal Ground |
| 19 | GND | — | Signal Ground |
| 20 | GND | — | Signal Ground |
| 21 | GND | — | Signal Ground |
| 22 | GND | — | Signal Ground |
| 23 | GND | — | Signal Ground |
| 24 | GND | — | Signal Ground |
| 25 | GND | — | Signal Ground |

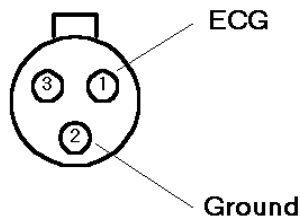
3.4.8 Printer port

The printer port is one of the two parallel ports. This interface, hereafter designated **LPT1**, is a standard printer port in the form of a 25-pin Subm-D adapter connector (female).

3.4.9 TRAM-NET interface (Microlab only)

9-pin connector (male) for communication with the Tram-Rac.

3.4.10 Analog output (optional)



Analog ECG output specifications:

| | |
|----------------------|---|
| Signal: | lead 2 without PACE pulse |
| Gain: | 1V/mV |
| Max. amplitude: | +/- 10V |
| Max. output current: | +/- 5mA at 2 kohm |
| Normal precision: | Offset: < 300mV (full scale), gain < 3% |
| Voltage stability:> | 1.5kV |
| Max. frequency: | 100Hz |

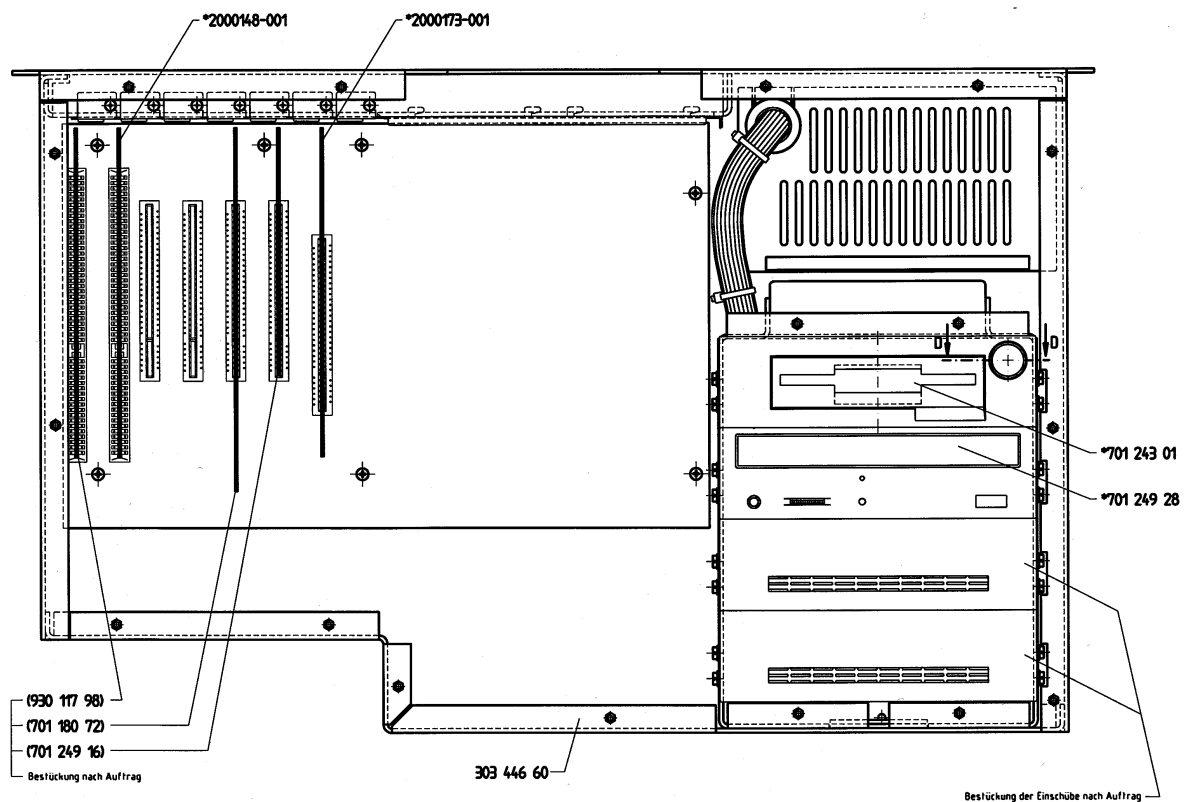
As from CardioSoft 3.0 and CORINA software version 3.0 the lead can be selected as required (without PACE pulse)!

When connecting up a peripheral make sure that this instrument has an input low pass of < 400Hz. If this is not the case, a (passive) low pass should be installed in the input of the peripheral (Important: do not change the signal level!).

4 System/Connector Configuration

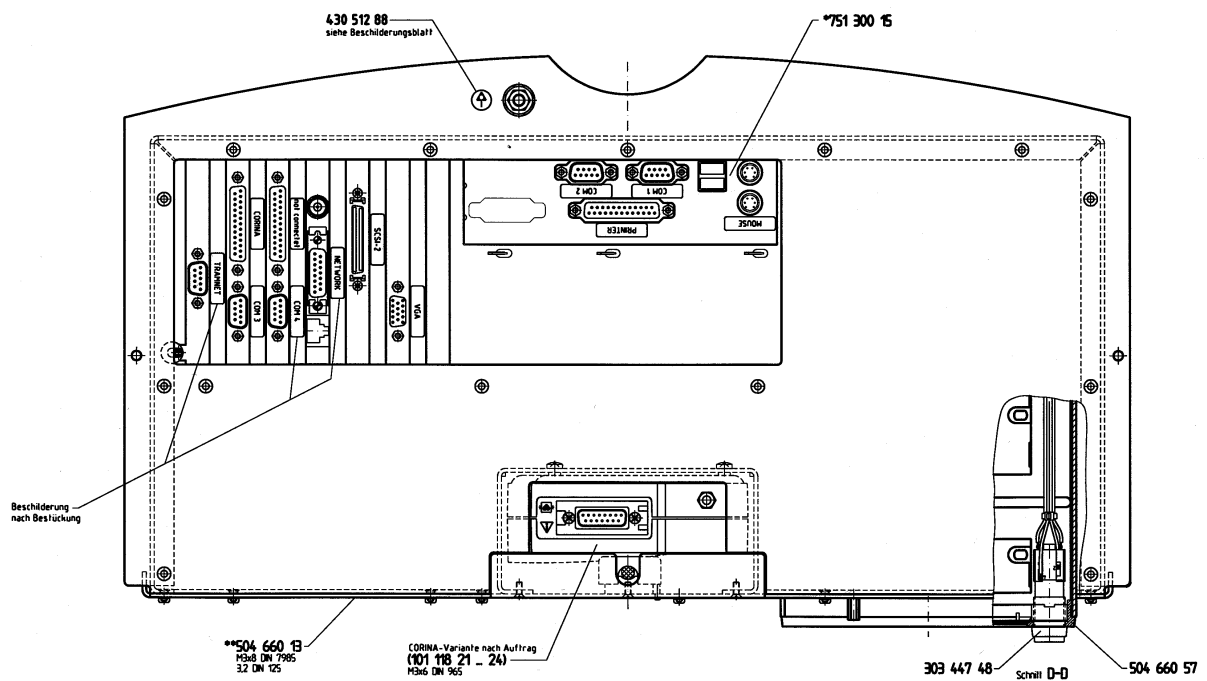
4.1 Pentium II PC 220 108 01

PC front view

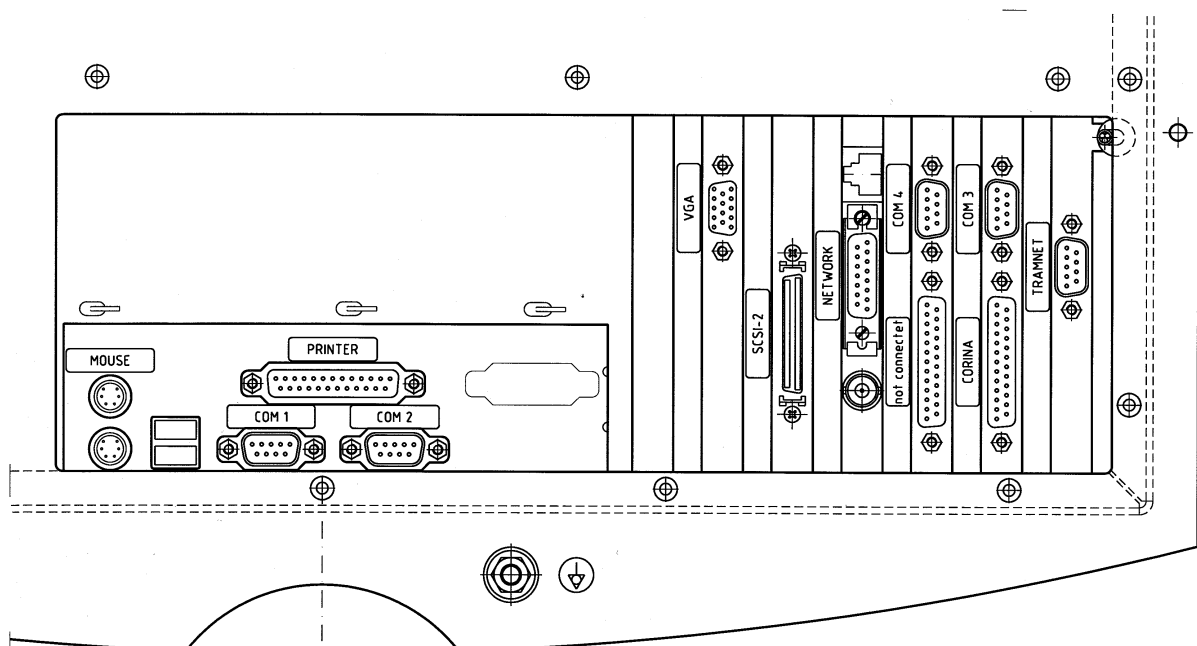


Instead of 70124916 SCSI Controller Adaptec AHA2910 you can also use the newer pcb 2001967-001 SCSI Controller Adaptec AVA 2904.

PC top view



Connector view



5 Installation

5.1 Installation of the hardware components

All connectors (including the patient lead) for system components and additional instruments are located under the cover flap. **Important: The cover flap may only be opened by the technical staff.** The system is supplied ready for operation. Only the monitor, PC keyboard, function key keyboard (optional), mouse and any required additional instruments need to be connected. To do this proceed as follows:

Open cover flap. Release lock with the appropriate tool.

* **Monitor:**

Place monitor in the monitor mounting and secure with the tilt-safe holder. Connect the monitor power cord (emerging from the cable runway) to the monitor. Insert the monitor signal cable into the cable runway and connect up to the monitor interface.

* **Mouse**

Place the mouse on the pull-out shelf. Insert the cable into the cable runway. Put ferrite on the end of the cable. Connect cable to the mouse interface (PS2).

* **Function key keyboard (optional)**

Place function key keyboard on the pull-out shelf. Insert function key keyboard cable into the cable runway and connect it up to the keyboard interface.

* **PC keyboard (optionally with card reader)**

Place PC keyboard on the pull-out shelf.

1.) Without function key keyboard:

Insert PC keyboard cable into the cable runway and connect up to the keyboard interface.

2.) With function key keyboard:

Connect keyboard cable to the function key keyboard. Insert remaining keyboard cable into the cable runway.

(Important! When using the PC keyboard with a card reader, set switch on bottom of keyboard to "Mode 2".)

Important! The PC keyboard with a card reader must not be used in combination with the function key keyboard.

* **Patient cable**

Connect up patient cable to CORINA (patient input).

Put ferrite near the connector of this cable.

Important: the patient cable may only be connected up to this interface.

* **Printer (optional)**

Place printer on the shelf. Connect the printer cable up to the printer and printer port (LPT1). Connect the additional non-fused earth conductor connector up to the printer and the system cart (see figure in Section 4 Adaptor connector configuration). Connect printer power cord up to a separate power cord connector socket (Important! Not to the system cart).

Important: Only printers modified by Marquette Hellige (with additional non-fused earth conductor connected) are to be placed on the system cart, when in patient use.

5.1.1 Microlab: Assembling the Tram-Rac, possible structural modifications

The CardioSys User's Manual describes how to assemble the Tram-Rac. Nevertheless, here are a few addition comments.

A description of how to assemble the Tram-Rac and the connection to the PC and the dongle are described in the CardioSys User's Manual.

Retaining bow for the power cord: strain relief on the power cord is removed by the Tram-Rac. The retaining bow for the power cord is attached by the same screw as on the Tram-Rac after the power cord has been threaded through.

The Tram-Rac can now be mounted to the two sides of the cart. When doing this make sure that the power cord and the connection cable are laid in the corresponding side member.

Microlab is normally meant for use whilst the operator is standing up. By dismantling the keyboard drawer it can be modified for operation in the sitting position.

5.2 Installation of the software

After Software installation please reboot the system!

5.2.1 Installation of CardioSoft

For CardioSoft start the Setup Program without parameter.

5.2.2 Installation of CardioSys

For CardioSys start the Setup Program with parameter "**cardiosys**" (for example setup cardiosys). For Software Update start the Setup Program without parameter.

5.2.3 Installation of MicroLab

For MicroLab start the Setup Program with parameter "**microlab**" (for example setup microlab). For Software Update start the Setup Program without parameter.

5.2.4 Update from 16 Bit CardioSys to 32 Bit CardioSys

With the following steps you can copy all patient data, procedure data and configuration data from a 16 Bit CardioSys (Version V1.0 to V3.X) to a 32 Bit CardioSys (Version V4.1).

1. Copy the directory "C:\CARDIO" and all subdirectories to a Backup Media (this Backup Media must be compatible with Windows NT 4.0). Restore this directory to "D:\CARDIO".
2. Copy the CARDIO.INI file from the Windows directory to a floppy disk and copy it to the Windows NT directory.
3. Copy the WIN.INI file from the Windows directory to a floppy. Open this file with Editor (notepad.exe). Open the WIN.INI file in the Windows NT directory with the Editor (notepad.exe). Copy the section "[CARDIO]" and the section "[EGM_RECORD]" from WIN.INI of the floppy the WIN.INI file in the Windows NT directory. Delete the file CA_SYS.INI in the Windows NT directory (if available).
4. Copy the file PERM_MEM.DAT from the Windows directory to a floppy and copy it to the Windows NT directory.
5. Install CardioSys or MicroLab to the target directory "D:\CARDIO".

5.2.5 Installation of Communication Server

The Communication Server is a separate PC with up to 4 Modems connected. Rest ECG procedures can be send from MicroSmart, CardioSmart, MAC 1100, MAC 1200 to this Communication Server over a Modem. The Communication Server stores the Rest ECG's in a local network server and can this data send to MUSE. **This PC can only used as Communication Server and cannot used for other purpose.**

Prerequisites: CardioSoft V4.1, PC with minimum requirement see CardioSoft User Manual, Up to 4 serial ports. Up to 4 Modems (important **all Modems must be from the same type**), PC must be integrated in a local network to store the data or send the data to MUSE.

Installation Steps:

1. Install CardioSoft V4.1 on the PC
2. Start the CardioSoft Application and view the System Configuration. In the Tab Modem select the Baud Rate and the Modem Type (The Port Setting is not used for the Communication Server). In the Tab MUSE you can configure to send the Rest ECG's to MUSE (The setting "Start Modem connection before transfer" cannot be used). In the Tab General please deactivate the "Enable Password Function".
3. For every Modem create a Shortcut to the CardioSoft Application. In the Properties Dialog of the Shortcut view Tab Shortcut. For Modem 1 at COM1 change the content of the field "Target" to "...\\cardio.exe cartmodem com1" and rename the shortcut to "CardioSoft Modem 1". Change the other Shortcuts in the same way.
4. Connect all Modems and switch on all Modems. Start the first Shortcut. It should be displayed a window with the title "COM1: Data received form ECG System/ECG recorder". If a error message is displayed check the Modem Settings. Press the "End" Button in the window and close the CardioSoft Application. Test every shortcut in the same way.
5. Copy all Shortcuts to the Menu Group "Start up" with the Windows NT Explorer.
6. Close all applications and reboot the system.

With every start up to 4 CardioSoft Applications are started and store the received Rest ECG's. If errors messages are displayed, than check the error like described in Position 4.

5.2.6 General Entries in *.INI Files, CA_SYS.INI

Procedure Setups will be stored in CARDIO.INI. General settings will be stored in CA_SYS.INI and could be exported to floppy disc. Special service settings are stored in WIN.INI (see 5.2.7). When CardioSoft is started the first time and there is no CA_SYS.INI or no entry in this INI file the default values from the WIN.INI will be used and copied to the CA_SYS.INI file. After that this values from the CA_SYS.INI file are used.

5.2.7 Entries in WIN.INI

Entries from the file WIN.INI described here are mainly those which cannot be changed directly by changing settings in CardioSoft.

Font entries, full screen, HF output ...

[CARDIO]

```
GRA_ScreenFont1 = "...      // Default ="MS Sans Serif"
GRA_ScreenFont2 = "...      // Default ="Arial"
GRA_ScreenFont3 = "...      // Default ="Courier New"
GRA_ScreenFont4 = "...      // Default ="Small Fonts"
GRA_ScreenFont5 = "...      // Default ="MS Sans Serif"
```

```
GRA_PrinterFont1 = "..." // Default ="Times New Roman"  
GRA_PrinterFont2 = "..." // Default ="Arial"  
GRA_PrinterFont3 = "..." // Default ="Courier New"  
GRA_PrinterFont4 = "..." // Default ="Small Fonts"  
GRA_PrinterFont5 = "..." // Default ="Times New Roman"
```

Analog HF output for stress test recording

The value 'ANAHzMaxVolt' indicates which output voltage should correspond to the maximum heart rate of 300 1/min. A maximum voltage of 10 volts is possible. Only whole numbers (1, 2, 3, ... 10) can be used to express this parameter and is given in volts. The value 'AnaHzPort' indicates which of the serial interfaces the DA transducer module is connected up to. The value 2, for example, corresponds to the COM2 interface. If the value 'AnaHzPort' is set at 0, or if the two entries are absent from the file WIN.INI, then this function will be disabled.

Example of entry in WIN.INI file

```
[EGM_RECORD]  
AnaHzMaxVolt=3  
AnaHzPort=2
```

Regular output of stress test data into the file ERGOSPIR.DAT during the recording:

To activate this function make manually the entry 'SpiroOption=1' in the section [EGM_RECORD] in the file 'WIN.INI'. The 'WIN.INI' file is in the Windows directory. To deactivate this function the entry must be 'SpiroOption=0'.

Example entry in the file 'WIN.INI' in the Windows directory:

```
[EGM_RECORD]  
SpiroOption=1 //1: initiate output  
//0 or not available: no output
```

CardioSys writes the stress test data every 5 seconds to a shared file with the name 'ERGOSPIR.DAT'. The default directory for the file is 'C:\TEMP'. It is possible to change the directory of the shared file with a entry in the file 'WIN.INI' in the Windows directory. The name of the entry must be 'SpiroDirectory' in the section [EGM_RECORD].

Example entry in the file 'WIN.INI' in the Windows directory to change the directory for the shared file 'ERGOSPIR.DAT':

```
[EGM_RECORD]  
SpiroDirectory=C:\SPIROAPP\DATA // default: C:\TEMP
```

CardioSys updates every 5 seconds the shared file with the following string:

[recoxxx34xMxxxx0x%xxx60xxx4x-999x-999x-999xx-19xxxx1xx-12x]4CCR

where a space is shown as an 'x'.

| Part of string | Meaning | Notes | |
|----------------|--------------------------|--------|------|
| [| Beginning | | |
| reco | Stage 'Recovery' | 5, 10 | |
| xxx34 | Speed * 10 | 3.4 | 5, 8 |
| xM | Speed designator | MPH | 1 |
| xxxx0 | Grade * 10 | 0.0 | 5 |
| x% | Grade designator | % | 2 |
| xxx60 | Heart Rate | 60 BPM | 5 |
| xxx4 | Ectopic Beats per Minute | 4 | 3, 6 |
| x-999 | BP Measurement NBR | -999 | 6, 9 |
| x-999 | Systolic BP | -999 | 4, 6 |
| x-999 | Diastolic BP | -999 | 4, 6 |
| xx-19 | ST Level [mm] * 10 | -1.9 | 6 |
| xxxx1 | ST Slope [mV/s] * 10 | 0.1 | 6 |
| xx-12 | ST Integral uV | -12 | 6, 9 |
| x] | Ending | | |
| 4C | Checksum | 7 | |
| CR | Carriage return | | |

Notes:

1. Could be 'K' for KPH. Kilometers per hour. If so, SPEED is KPH.
Could be 'P' for KPM. Kilopondmeters. If so, SPEED is KPM from Ergo.
Could be 'W' for WATTS. Watts. From Ergo.
2. Could be 'D' for DEGREES. If so, GRADE is DEGREES.
3. This is ECTOPIC COUNT for the minute previous.
4. mmHg
5. If unavailable, pass 0.
6. If unavailable, pass -999.
7. Rightmost 2 ASCII characters of checksum. Checksum includes
[, all spaces,] Alpha characters must be Upper Case.
8. If Ergometer Watts or KPM, SPEED value is not *10.
9. Not supported in the current version (value = -999)

10. The stage names are fixed as the following table shows:

| Phase | Stagenumber | Stagename in the shared file (4 characters) |
|----------|-------------|---|
| Pre-Test | 1 | base |
| Pre-Test | 2 | warm |
| ... | ... | warm |
| Exercise | 1 | ramp |
| ... | ... | ramp |
| Recovery | 1 | reco |
| ... | ... | reco |

[EGM_RECORD]

SpiroOption=1 //1: initiate output
//0 or not available: no output
SpiroDirectory=C:\SPIROAPP\DATA // default: C:\TEMP

[CARDIO]

CFG_ProdName=GE marquette CardioSys // Product name for CardioSys
GE marquette MicroLab // Product name for MicroLab

CFG_CorinaTime=5

CFG_Abcux=2977 // 2978 or entry not available: USA version
// 2977: international version

If the file win.ini is inadvertently deleted, only the USA version of CardioSoft can be started. It is thus advisable to make a backup of the INI files from time to time.

CFG_StressAndRest= // 1: USA version also has resting ECG option

RES_ShowQTDispTable=? // Range of values: 0..1 Default: 0
// Meaning: Output of the QT data for all leads in the measurement table

GRA_PrinterFontFactor=? // Range of values: 50..500 Default: 100
// Meaning: Font size factor for print fonts

GRA_ScreenFactor=? // Range of values: 50..500 Default: 100
// Meaning: Multiplication factor for screen display fonts

GRA_GridWeight=? // Range of values: 1..9 Default: 5
// Meaning: Grid points in printouts

PRI_EcgSize=? // Range of values: 0..5 Default: 2
// Meaning: Thickness of the ECG waveform traces on printouts
// 0 and 1 might cause gaps when using an AR200

GRA_CharSet=? // Range of values: 0..4 Default: 0
// Meaning: Determines the character set for the
CardioSoft fonts.
0: ANSI_CHARSET
1: DEFAULT_CHARSET
2: SYMBOL_CHARSET
3: SHIFTJIS_CHARSET
4: OEM_CHARSET
// Recommendation for Japanese:

GRA_ScreenFont Factor=? // Range of values: 50..500 Default:100
// Meaning: Multiplication factor for screen display
fonts

RES_H1_Format1=V1,V2,V3,V4,V5,V6 //6 leads for 1. H1 format (separated by decimal
point)

RES_H1_Format2=I,II,III,V1,V2,V3 //6 leads for 2. H1 format (separated by decimal
point)

5.2.7.1 Setting 12SL analysis

12SL_Measurement=? // Range of values: 0..1 Default: 0
// Meaning: 0: analysis with "Hellige Heart"
1: analysis with "marquette 12SL"

// additional settings possible for the 12SL analysis

12SL_SCREEN_CRIT=? // Range of values: 0..1 Default: 0
// Meaning: when 1 has been selected the following
12SL findings do not appear on the ECG reports:
ANTERIOR INFARCTION
INFERIOR INFARCTION
NONSPECIFIC ST ABNORMALITY
NONSPECIFIC T-WAVE ABNORMALITY =
suppressed only when the abnormality is
ABNORMAL QRS T ANGLE, CONSIDER T-WAVE
ABNORMALITY

12SL_SUPPR_NORMAL=? // Range of values: 0..1 Default: 0
// Meaning: when 1 has been selected the 12SL
finding NORMAL ECG is prevented from appearing
in the ECG report.

12SL_SUPPR_ABNORMAL=? // Range of values: 0..1 Default: 0
// Meaning: when 1 has been selected the 12SL
finding BORDERLINE FINDING or ABNORMAL
ECG is prevented from appearing in the ECG
report.

12SL_SUPPR_DIAG=? // Range of values: 0..1 Default: 0
// Meaning: when 1 has been selected this
prevents a 12SL diagnosis being printed out.

// Some printer drivers have problems managing the printout area, so that the last line //
may be missing, for example. Where printing should start can be set as follows:
PRI_FrameLeft=? // left-hand margin in 1/10 mm
PRI_FrameTop=? // top margin in 1/10 mm

5.2.7.2 Settings for Russian under Windows 98

GRA_ScreenFont2="Arial Cyr"
GRA_ScreenFont3="Courier New Cyr"

GRA_PrinterFont1="Times New Roman Cyr"
GRA_PrinterFont3="Courier New Cyr"
GRA_PrinterFont5="Times New Roman Cyr"

5.2.8 Entries in AR200.INI

The DLL for the General Scanning electrothermal printer AR200 accesses this
initialization file. During installation it is copied into the Windows directory.

StartWithTopOfForm=? // Range of values: 0..1 Default: 0
// Meaning: At the beginning of an examination
the paper is fed the beginning of the
page

StopWithFormFeed=? // Range of values: 0..1 Default: 0
// Meaning: At the end of an examination the
paper is fed approx. 3 cm above the
beginning of the next page
The setting "StartWithTopOfForm=1"
must be selected so that the next
examination recording can be made
starting at the beginning of a page.

StopWithTopOfForm=? // Range of values: 0..1 Default: 0
// Meaning: At the end of an examination the
paper is fed to the beginning of the next
page

EcgSize=? // Range of values: 0..4 Default: 3
// Meaning: Thickness of trace printed out during
a recording
1 : very thin
2 : thin
3 : normal
4 : thick
// only takes effect while recording

5.2.9 Entries in SETUP_CM.INI

This file is located in the program directory.

Option to set the sorting sequence of the alphanumerical key as required. Example: sort patients in reverse order; max. 255 characters permitted

[DATABASE]

SortTable="ZzYyXxWwVvUuTtSsRrQqPpOoNnMmLlKkJjIiHhGgFfEeDdCcBbAa"

This entry only comes into effect when made **before calling up CardioSoft for the first time**. The sorting sequence is stored in the database during its creation. If a change in the sorting sequence is to be made at some later time, the entire database has to be deleted.

5.2.10 System control settings / printer

5.2.10.1 Bios Configuration

During startup press F2 on request to enter the setup menu. You can leave each menu by pressing ESC. Changes will be stored.

[Main]

| | |
|-----------------------|------------------------------|
| Language: | [English (US)] |
| L2 cache ECC Support: | [Disabled] |
| System Time | [Please fill in actual time] |
| System Date | [Please fill in actual date] |

[Advanced]

| | |
|--------------------------|--------|
| Plug and Play O/S: | [No] |
| Reset Configuration Data | [No] |
| Numlock: | [Auto] |

[Advanced - Peripheral Configuration]

| | |
|------------------|-----------|
| Serial port A: | [Enabled] |
| Base IO address: | [3F8] |
| Interrupt: | [IRQ 4] |

| | |
|------------------|-----------|
| Serial port B | [Enabled] |
| Mode | [Normal] |
| Base IO address: | [2F8] |
| Interrupt: | [IRQ 3] |

| | |
|------------------|------------------|
| Parallel port: | [Enabled] |
| Mode: | [Bi-directional] |
| Base IO address: | [378] |
| Interrupt: | [IRQ 7] |

Advanced - IDE-Configuration

| | |
|-----------------|-----------|
| IDE-Controller: | [Primary] |
|-----------------|-----------|

Advanced - Resource Configuration

| | |
|---------|------------|
| IRQ 5: | [Reserved] |
| IRQ 10: | [Reserved] |
| IRQ 11: | [Reserved] |

Advanced – Power

| | |
|--------------------|------------|
| Power Management : | [Disabled] |
|--------------------|------------|

Boot

| | |
|-----------------------------|--------------|
| Boot-time Diagnostic Screen | [Enabled] |
| Quick boot Mode | [Enabled] |
| Scan User Flash Area: | [Disabled] |
| After Power failure: | [Last State] |
| On Modem Ring: | [Stay Off] |

On LAN: [Stay Off]

On PME: [Stay Off]

First Boot Device [Hard Drive]

Second Boot Device: [Removable Devices]

Third Boot Device: [ATAPI CD-ROM Drive]

Fourth Boot Device [Network Boot]

All other configurations are default configurations.

5.2.10.2 Install a Laser Printer

List of Printers and which Printer drivers you have to select and where you find the printer driver if it is not installed:

| Printer | Minimum Memory of the printer | Printer driver | where you find the printer driver |
|--|-------------------------------|--|---|
| Epson EPL 5500 | 5 MB | EPL-5600 | Windows NT CDROM |
| Epson ELP 5600 | 5 MB | EPL-5600 | Windows NT CDROM |
| Epson ELP 5700 | 5 MB | EPL-5700 Advanced CardioSoft & Windows98: EPL-5500 | Disk/CDROM delivered with the printer Windows98: use the EPL-5500 Printer Driver |
| HP 6P HP2100 HP4050N | 6 MB | HP LaserJet 5M | Windows NT CDROM HP4050N: Not to be used with CardioSys |
| All Laser Printers with HP4 Emulation! | 6MB | HP4 | Windows NT CDROM Recommended driver for all printers |

**CardioSys / MicroLab: Printer drivers are installed in subdirectory:
C:\SUPPORT\....**

Important Laser Printer Driver Settings:

1. Activate Tab "Port". Click on button "Configure Port". The "Timeout (seconds) **Transmission Retry**" must be set to **90 seconds**.
2. Activate Tab "Scheduling" and activate "**Print directly to the printer**".
3. Activate Tab "Device Settings" and set the "**Installed Memory (Kilobyte)**" to the value of installed Memory in the printer.

5.2.10.3 Installation Instruction HP6(M)P

DEVICE NAME: HP Laser Jet 6P



DATE: 22.3.2000

PART NO.: 701 276 01 / ..02 / ..03

SEITE/N: 1/3

AUTHOR: Roland Banholzer

Only specially trained, technical staff is permitted to install the printer HP LaserJet 6P in the patient environment and to put it into operation. The requirements of IEC 601-1 must be observed. Furthermore, the manufacturer's safety information and general ESD protection measures are to be observed during installation!

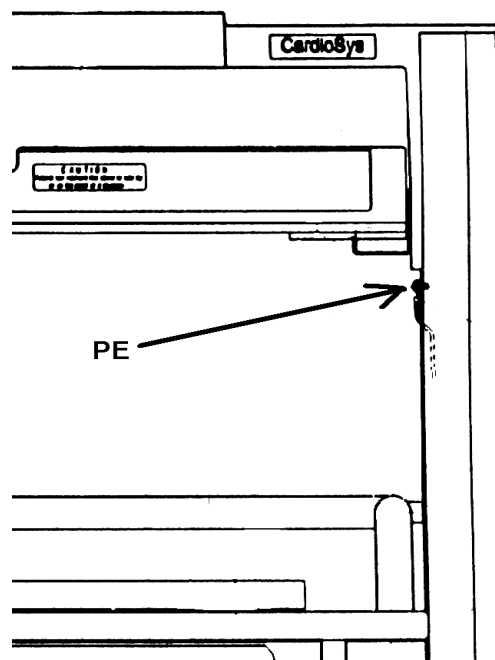
-  **Have a look at the user's guide and carefully read the safety information!**
- ☐ Unpack the printer and assemble the extra components as described in the user's guide.
-  **When operating the printer in the patient environment (1.5 m/5 ft.) in conjunction with CardioSys/MicroLab, please observe the instructions describing the installation of the potential equalization pin on pages 2 and 3 of this document!**

Installing the Potential Equalization Pin in CardioSys / MicroLab Systems

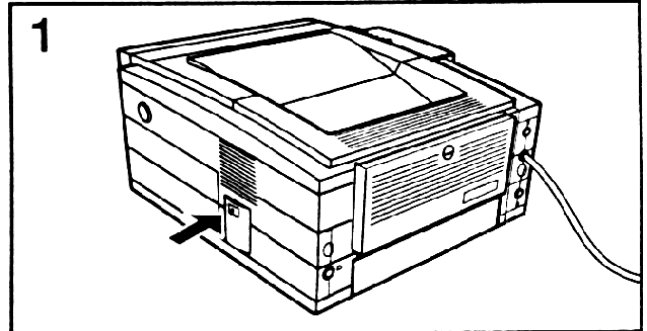
When operating the printer "HP Laser Jet 6P" in the patient environment in conjunction with CardioSys / MicroLab (1.5 m/5 ft.), an **authorized service technician** is required to install the **potential equalization** pin as described below.

□ Installation:

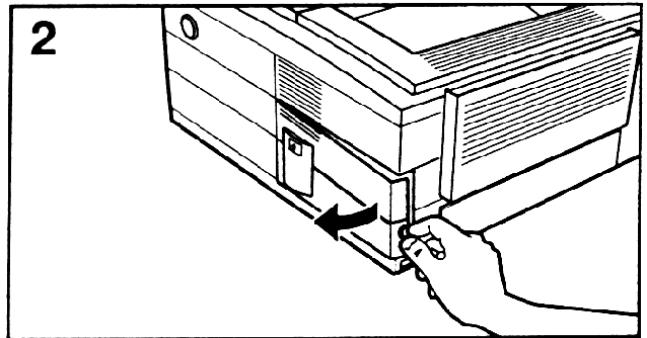
1. Unscrew the potential equalization cable "**PE**" from CardioSys / MicroLab (see illustration) and pull out a length of cable that is sufficient to connect it to the printer. (Caution: You will need the screw and washer later when connecting the cable.)
(For older CardioSys systems (without potential equalization cable for the printer) it is recommended to provide a separate potential equalization cable in parallel with the printer power cord and to connect it to ground (GND).)



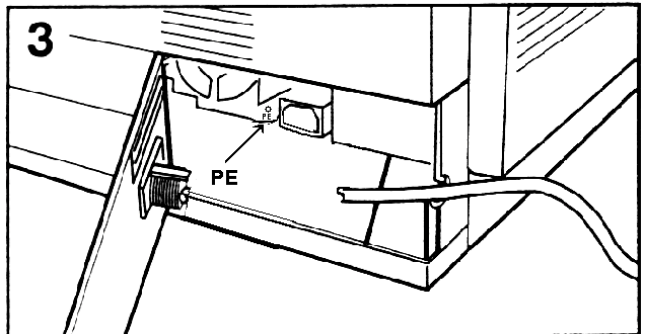
2. Switch off the printer and CardioSys / MicroLab. (Printer power switch must not be depressed).
3. Open the cover of the power cord connection on the right-hand side at the back of the printer. Use the finger aperture for better leverage.



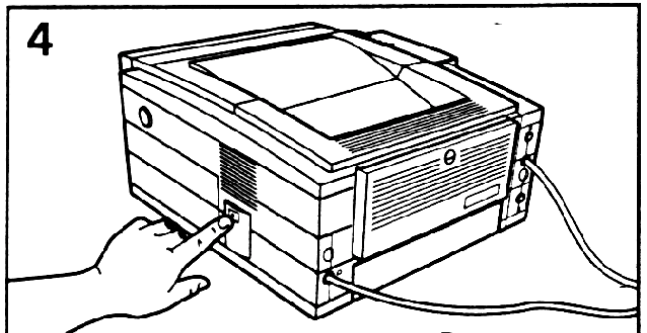
4. **Disconnect the printer from the power line!** Take the potential equalization cable of CardioSys / MicroLab and, using the screw removed from CardioSys / MicroLab, screw it to the boring provided for this purpose (labelled "PE") (Figure/Bild 3). Place the retaining ring between the lug and the printer housing and the washer between the lug and the screw head.



5. Plug the power cord into the printer power connector. **To protect the cables from mechanical strain, secure them with a Panduit strap.** Reattach the cover of the power cord connector and conduct both cables through the aperture.



6. **Now measure the protective earth conductor impedance according to IEC 601-1 between the printer's protective earth connection (mains plug) and the CardioSys / MicroLab potential equalization pin. The value must be $< 0.2\Omega$! Also measure the enclosure leakage current.**



7. **Connect the printer and CardioSys / MicroLab to separate wall outlets and turn them on.**
8. If all measurement results are within the admissible range, replace the sticker "Important: Do not operate the device in the vicinity of the patient (1.5 m/5 ft.)" with the sticker "CardioSys/MicroLab ..." (refer to Labelling Sheet).

5.2.10.4 Installation Instruction EPL5700

DEVICE NAME: EPSON EPL5700

DATE: 22.3.2000

PART NO.: 701 242 79

AUTHOR: Roland Banholzer / Wolfram Waltersberger

Only specially trained, technical staff is permitted to install the EPSON printer EPL5700 in the patient environment and to put it into operation. The requirements of IEC 601-1 must be observed. Furthermore, the manufacturer's safety information and general ESD protection measures are to be observed during installation!

Have a look at the user's guide and carefully read the safety information!

Unpack the printer and assemble the extra components as described in the user's guide.

When operating the printer in conjunction with CardioSys/MicroLab, please observe the instructions describing the installation of the additional protective earth conductor on pages 2 and 3 of this document!

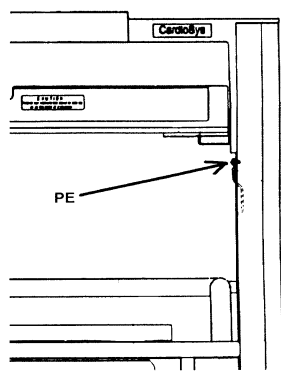
Then you can connect the printer to the power line and switch it on.

Installing the Additional Protective Earth Conductor in CardioSys / MicroLab Systems

When operating the printer in conjunction with CardioSys / MicroLab in the patient environment (1.5 m), an **authorized service technician is required to install an additional protective earth conductor** as described below.

Parts set Printer EPL5700: Marquette Hellige Part No. 384 018 83

Figure 1



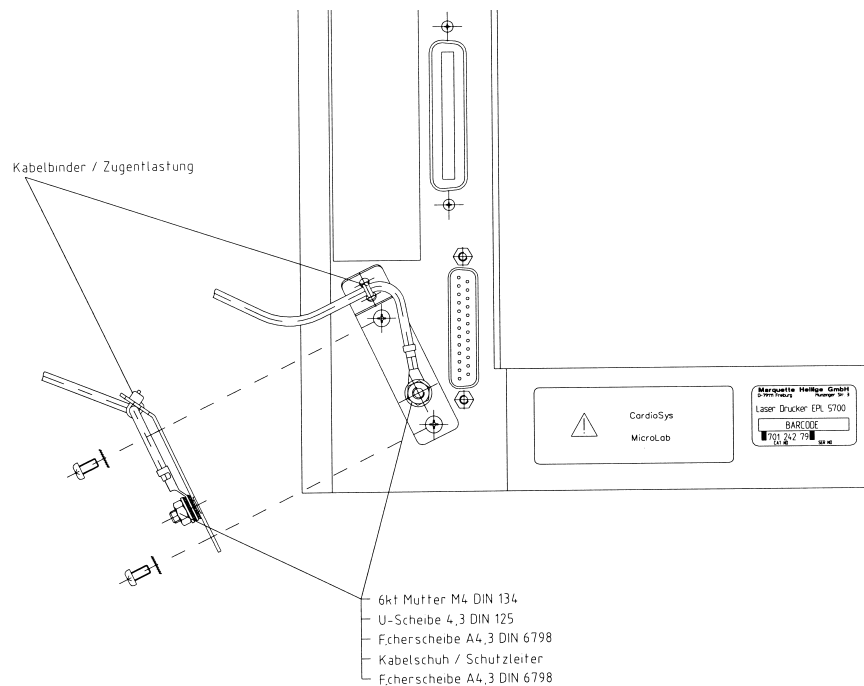
1. Switch off printer and disconnect power cord from wall outlet.
2. Unscrew the potential equalization cable PE at CardioSys/MicroLab (see Figure 1) and pull out as much of the cable as needed to connect the cable at the rear of the printer. (When the CardioSys system is an older model (without potential equalization cable for the printer) a separate potential equalization cable should be installed in parallel with the printer power cord and connected to ground (GND).
3. Remove the two screws on the rear of the printer (see Figure 2).
4. Using these screws and the tooth lock washers, attach the supplied ground strip (see Figure 2).
5. Now take the potential equalization cable from CardioSys/MicroLab and screw it to the ground strip provided for this purpose (see Figure 2). Attach the mounting accessories in the following order: tooth lock washer, cable lug, tooth lock washer, washer and M4 nut (Figure 2).
6. To protect the potential equalization cable from mechanical strain, secure it with the supplied cable tie.
7. **Now measure the protective earth conductor impedance according to IEC 601-1 between the printer's protective earth connection (mains plug) and the ground strip. Make a second measurement of the protective earth conductor impedance between the protective earth connection (mains connector) of**

CardioSys/MicroLab and the printer ground strip. The value must be $< 0.2\Omega$! Also measure the enclosure leakage current.

8. Connect the printer to a wall outlet and switch it on.

9. If all measurement results are within the admissible range, replace the sticker "Important: Do not operate the device in the vicinity of the patient (1.5 m/5 ft.)" with the sticker "CardioSys/MicroLab ..." (refer to Labelling Sheet).

Figure 2



5.2.10.5 Installing the AR200 Printer Software

INSTALLATION INSTRUCTIONS FOR AR200P THERMAL ARRAY RECORDER WINDOWS NT 4.0 DEMONSTRATION SOFTWARE

BEFORE INSTALLING THE SOFTWARE

Before installing the AR200P software, there are a few preliminary steps which will make things go more smoothly.

First, reboot your computer, enter the CMOS setup program (often by pressing the "DEL" or "F1" key immediately after rebooting) and check the the operating mode of the parallel (printer) port that you will be using for the recorder. It should be set to "Standard Centronics" (sometimes called "Compatible") rather than bidirectional, ECP, or EPP. After installation has been completed and proper recorder operation verified, you will most likely be able to change the port back to its original setting.

The installation procedure will want some files from the original Windows NT 4.0 distribution CD, so have it ready.

Log on to your computer with Administrative privileges. It may be necessary to reboot the machine as part of the installation procedure, so you should not be running any other important programs.

Use the same Centronics printer cable that you will eventually be using for the recorder to connect a standard printer to the LPT port that you will be using for the recorder. Print a short test file to verify that the cable and port are operating properly.

SOFTWARE INSTALLATION

First, install ardrv.sys, the kernel-mode recorder driver. (You must be logged on with Administrative privileges to do this.)

Put the software distribution diskette into a floppy drive. Open up a "command prompt" and switch the prompt to the root directory of the floppy. Type DRVINSTL. This will copy ardrv.sys to the NT "drivers" subdirectory (%windir%\system32\drivers, where %windir% is the name of the Windows directory, usually c:\winnt). It will then install the driver, which involves adding entries to the registry. Finally, it will start the driver.

If you see an error message, use the Windows device manager to see if ardrv is listed as a device and what its status is. If it is listed but is not shown as running, reboot the machine which should start it automatically.

Next, install the printer driver. This is a standard NT printer driver, and is installed by clicking on the "printers" item off of the "settings" choice on the NT "start" menu.

Click on "Add Printer" and follow the instructions of the "Add

Printer" wizard. Be sure to select a local LPT port. When you see the list of manufacturers and models, click the "Have Disk" button. The necessary files are in the root directory of the recorder software distribution diskette. (You will also be prompted for the original Windows NT 4.0 distribution CD.) Select the "AR200P 8 inch Recorder," and follow the remaining prompts. Choose not to print a test page.

When the printer driver installation is complete, "GSI AR200P 8 inch Recorder" should appear on the list of printers. Right click on it and select "Document Defaults" from the pop-up menu. Click on the "Advanced" tab of the property sheet. Under "Document Options," click on "Metafile Spooling" and turn it off. Turn "Print Text as Graphics" on, and verify that "Print Quality" is set to normal.

Under "Printer", "Properties", "Scheduling" click on:
"Print directly to Printer".

This chapter is only relevant, if you do not have installed CardioSoft. CardioSoft uses the Default Port LPT1.

The next step in the AR200P installation procedure is to copy the AR200.INI file from the root directory of the distribution diskette to the computer's "Windows" directory (often C:\WINNT). If you have elected to use LPT2 or LPT3 instead of the default setting of LPT1, use an ascii text editor on the copy of the AR200.INI file in the "Windows" directory to change the "port=1" line to "port=2" or "port=3" as appropriate.

Next, create an AR200P directory on your system. Copy all of the files in the AR200P directory on the distribution diskette to the new directory.

Finally, run the ARDEMO program to verify that the recorder and software are operating correctly, and to determine the version number of the firmware resident in the AR200P flash eprom memory. To see the version number, click the "Help" menu choice on ARDEMO's menu bar, and then click "About." The item of interest is the firmware "BIC" version number.

If the "BIC" firmware version number is less than 1.35, it must be updated by running the ARUPDATE utility program supplied on the distribution diskette. ARUPDATE WILL NOT RUN UNDER WINDOWS NT. YOU MUST USE WINDOWS 3.1 OR MSDOS. See the ARUPDATE.TXT file for instructions.

AR200P THERMAL ARRAY RECORDER WINDOWS 98 DEMONSTRATION SOFTWARE INSTALLATION INSTRUCTIONS AND RELEASE NOTES

PRINTER DRIVER INSTALLATION

The installation procedure will want some files from the original Windows 98 distribution CD, so have it ready.

Use the same Centronics printer cable that you will eventually be using for the recorder to connect a standard printer to the LPT port that you will be using for the recorder. Print a short test file to verify that the cable and port are operating properly, and that the port is not redirected to the network.

The AR200P driver is a standard Windows printer driver, and is installed by clicking on the "printers" item off of the "settings" choice on the Windows 98 "start" menu.

Click on "Add Printer" and follow the instructions of the "Add Printer" wizard. Be sure to select a local LPT port. When you see the list of manufacturers and models, click the "Have Disk" button. The necessary files are in the root directory of the recorder software distribution diskette. (You will also be prompted for the original Windows 98 distribution CD.) Select the "AR200P 8 inch Recorder," and follow the remaining prompts.

When the printer driver installation is complete, "GSI AR200P 8 inch Recorder" should appear on the list of printers. Right click on it and select "Properties" from the pop-up menu. Click on the "Details" tab of the property sheet, then click the "Spool Settings" button. If you choose the "Spool print jobs..." setting, select "RAW" as the "spool data format." Click the "OK" button to dismiss the "Spool Settings" dialog box. Click the "End Capture" button to make sure that the printer output will not be redirected to a network connection. While still on the "Details" tab of the property sheet, click the "Setup" button. If the driver was successfully installed, you should see another printer-properties tabbed dialog box. Click on the "Device Options" tab and set "Print Quality" to "Normal." Click on "OK" to dismiss it.

Under "Printer", "Properties", "Scheduling" click on: "Print directly to Printer".

If you are unable to print to the AR200P even though the driver was successfully installed, the problem may be the mode of the computer's LPT port. Reboot the computer, enter the CMOS setup program (often by pressing the "INS" or "DEL" or "F1" key immediately after rebooting) and check the operating mode of the

parallel port you are using for the recorder. Try setting it to "Standard Centronics" (sometimes called "Compatible" or "SPP") rather than bidirectional, EPP, or ECP. When Windows reboots, retest the port by connecting it to a standard printer. If necessary, use the Windows 98 "Device Manager" to temporarily remove the LPT port so it will be redetected as a standard port at the next reboot.

SOFTWARE INSTALLATION

This chapter is only relevant, if you do not have installed CardioSoft. CardioSoft uses the Default Port LPT1.

Copy the AR200.INI file from the root directory of the distribution diskette to the computer's "Windows" directory (often C:\WINDOWS). If you have elected to use LPT2 or LPT3 instead of the default setting of LPT1, use an ascii text editor (such as the EDIT program in the \WINDOWS\COMMAND subdirectory) on the copy of the AR200.INI file in the "Windows" directory to change the "port=1" line to "port=2" or "port=3" as appropriate.

Next, create an AR200P directory on your system. Copy all of the files in the AR200P directory on the distribution diskette to the new directory.

Run the ARDEMO program to verify that the recorder and software are operating correctly, and to determine the version number of the firmware resident in the AR200P flash eprom memory. To see the version number, click the "Help" menu choice on ARDEMO's menu bar, and then click "About." The item of interest is the firmware "BIC" version number.

If the "BIC" firmware version number is less than 1.35, it should be updated by running the ARUPDATE utility program supplied on the distribution diskette. ARUPDATE WILL NOT RUN UNDER WINDOWS NT. YOU MUST USE MSDOS, WINDOWS 3.1, OR WINDOWS 98. See the ARUPDATE.TXT file for instructions.

PRINT DENSITY CONTROL

The combination of the updated firmware and printer driver adds the ability to set the print density (darkness) in printer mode. If you are printing large all-black areas, it will be necessary to reduce the density. Reduced density generally also gives better results when printing what was originally a continuous tone or color image. Printing of text or "line art" looks better at normal density.

To set the density by using the printer driver, click the "Device Options" tab of the printer "Properties" dialog box. The print quality may be set to either "Normal" or "Lighter Printing." This setting affects all printing, both text and graphics. When printing a continuous tone or color image, the dither pattern and the intensity slider on the "Graphics" tab of the "Properties" dialog box should also be adjusted for the best-looking printing.

Print density can also be adjusted by using a pcl command which overrides the driver setting. See the SOFTWARE.TXT file in the SOURCE subdirectory of the distribution diskette for more information.

WINDOWS 98

The AR200P Windows 98 software runs successfully on Windows 98 beta 3 (build 1650).

The printer-driver installation information file (OEMSETUP.INF) provided with this software package is for Windows 98 only.

FLASH MEMORY UPDATE UTILITY FOR AR200P RECORDER

ARUPDATE ver 1.00 1/31/98

The ARUPDATE utility permits updating the program resident in the flash eeprom memory of the General Scanning, Inc. AR200P chart recorder.

Before updating the recorder, run the Windows ARDEMO program supplied with the AR200P to verify that it is hooked up and working properly in your system. To start the recorder, click the "Front Panel" menu bar choice in ARDEMO and press the "Start" button. After you determine that the AR200P is working normally, press the "Close" button to stop it and close the front panel window.

Click the "Help" menu choice on ARDEMO's menu bar, and then click "About." This will display the version numbers of several recorder software and firmware components. Note the AR200P firmware "BIC" version number. If it is less than 1.10, the ARUPDATE utility is unable to upgrade it. Contact General Scanning, Inc. for more information.

In addition to the BIC version, the "AR200P firmware version" section of the dialog box displays the "HIP" and "PEP" version numbers. These refer to the processors in the print engine

contained inside of the AR200P, and will not be changed by the ARUPDATE utility. Click the "OK" button to dismiss the "About" dialog box, and click "Exit" on the menu bar to end ARDEMO.

IMPORTANT: ARUPDATE IS AN MSDOS PROGRAM AND WILL NOT RUN UNDER WINDOWS NT. YOU MUST USE MSDOS OR WINDOWS 3.1. MAKE SURE THAT NO OTHER PROGRAMS ARE RUNNING ON YOUR COMPUTER BEFORE YOU START ARUPDATE.

To run ARUPDATE under MSDOS, insert the AR200P software distribution disk into a floppy drive and change to the root directory of that drive. Type ARUPDATE (see the Windows 3.1 instructions below if the AR200P is connected to LPT2 or LPT3).

To run ARUPDATE under Windows 3.1, insert the AR200P floppy disk in a drive and select the "Run..." item from the "File" menu of the Windows 3.1 program manager. Type "x:ARUPDATE" (where x is the letter of the drive). This assumes that the AR200P is connected to LPT1. If it is hooked up to LPT2, type "x:ARUPDATE /LPT2" instead, or "x:ARUPDATE /LPT3" if connected to LPT3.

ARUPDATE will determine if it can upgrade your recorder's program, and if so, will ask if you want to replace the current version with the one on the ARUPDATE disk. If you press any key other than "Y," ARUPDATE will abort leaving the original program unchanged.

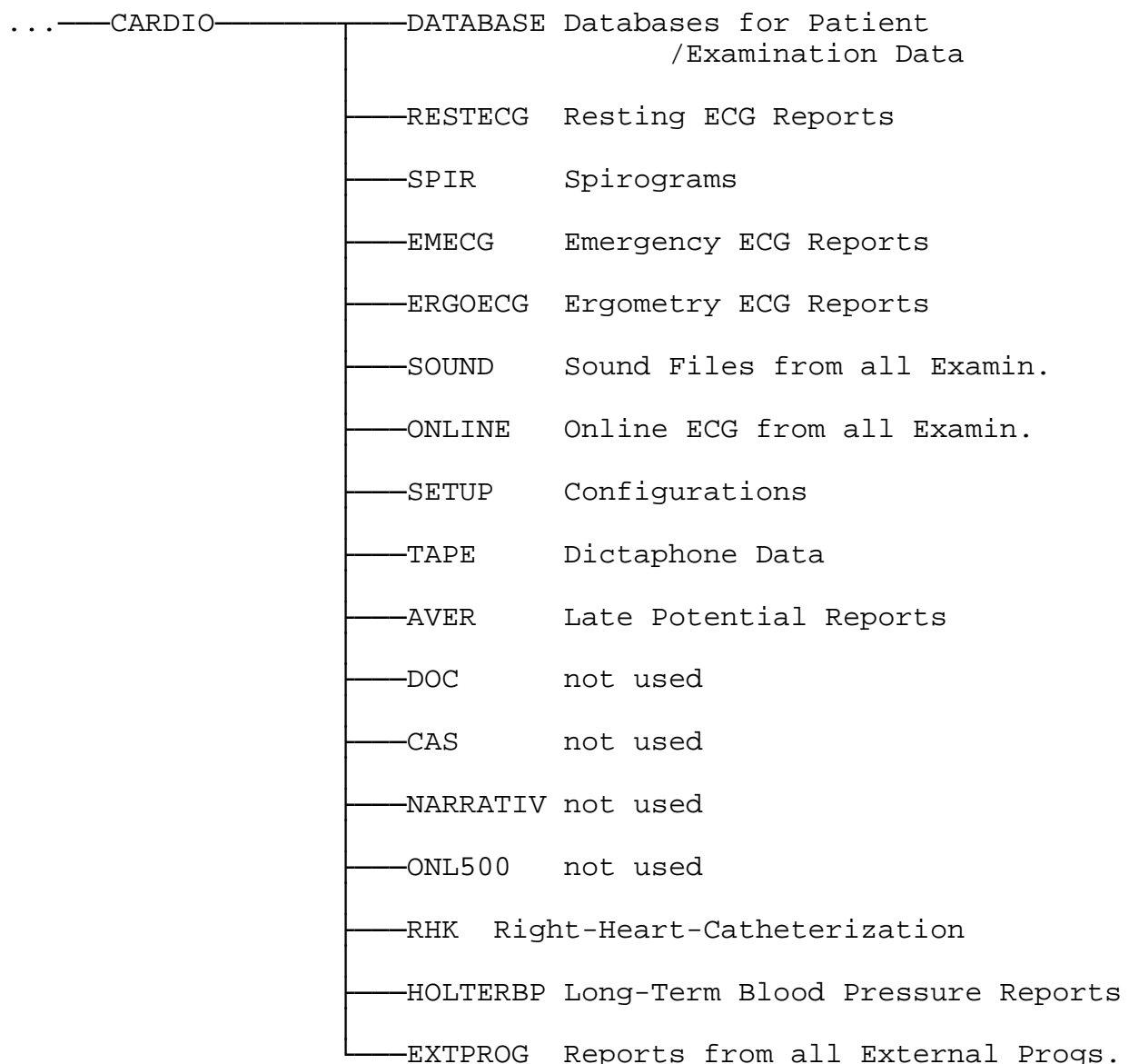
ARUPDATE performs several system checks before actually changing the contents of flash memory. If it detects a problem, it will display an appropriate error message and abort, leaving the recorder program unchanged. In the unlikely event that ARUPDATE fails during the erasure or reprogramming phases of the update process, it must be rerun to a successful completion before the AR200P can be used. Recheck the cable connections, turn the power off for 15 seconds, then back on, and retry ARUPDATE.

ARUPDATE FILES IN THE ROOT DIRECTORY OF THE AR200P SOFTWARE DISK

| | |
|--------------|---|
| ARUPDATE.EXE | Run this program to update flash memory. |
| ARUPDATE.PIF | Windows 3.1 program information file for above. |
| FLASHCOM.BIC | Auxiliary file needed by ARUPDATE.EXE |
| ARUPDATE.TXT | This file. |
| BCODE###.FPG | New file to be programmed into recorder flash memory. (The version number of the code appears in place of ###.) |

5.2.11 Directory structure and notes on CardioSoft files

When installing CardioSoft it creates a subdirectory (default: \CARDIO), into which the files required for execution are copied. When calling up CardioSoft for the first time several subdirectories are then created in this directory for the examination data, speech entries and the configuration data. After calling up CardioSoft the directory structure is as follows:



The data base files containing the patient data and the references (file names) from the examinations are located in the directory \DATABASE. BTRIEVE is used as a data base. The examination data from operating modes resting ECG, spirometry, emergency and ergometry are stored in the directories \RESTECG, \SPIR, \EMECG, \ERGOECG, respectively. In all examinations online ECGs are stored in \ONLINE, spoken comments in \SOUND. Dictaphone files are stored in \TAPE. Configurations are stored in the \SETUP directory.

CardioSys from version 3.0:

(some of the directories can be found in earlier versions)

\ATI : ATI video card driver
\NDIS : NDIS-Driver for network card (needed for TCP/IP)
\NET: network files
\SUPPORT\ADAEZLIT:xxx: Adaptec SCSI card driver
\SUPPORT\CARDIO.xxx : Copy of the CardioSoft installation disk (CardioSoft can be installed from these directories.)
\SUPPORT\FUJM2513 : Fujitsu MO driver 2513 driver
\SUPPORT\GRAPHIC : Graphics driver for onboard graphics for DOS, Windows 3.x, Windows 95, Windows NT
\SUPPORT\NETWORK : Network driver for IPX/SPX and TCP/IP protocols
\SUPORT\PRINTER : Installation disks for the printers AR 200, Epson EPL 5x00, HP Laserjet 6

Files in Windows system32 directory:

CardioSoft requires the following files from the Windows system32 directory:

v24.dll
Modem Functions.

Tni_drv.dll
TRAM-NET Functions.

Tni_lvdd.dll
TRAM-NET Interface card Software Download Function

wbtrv32.dll
Betrieve Data base Functions

w32mkde.exe, w32mkrc.dll
Betrieve Data base Engine

net_drv.dll
Functions for network operation

dzip32.dll, dunzip32.dll
Functions to compress/expand examination data

mfc41.dll, msvcrt.dll, msvcrtd.dll
Visual C++ class library Functions

Ardll.dll
Thermal Printer Functions

Winnet.dll
Internet Functions

Hel_grid.ttf
Special Font

Files in Windows system32\drivers directory:

CardioSoft requires the following files from the Windows system32/drivers directory:

Cor_sys.sys
CORINA driver

Tni_sys.sys
TRAM-NET driver

Tni_Isys.sys
Load TRAM-NET Interface Card Software

ardrv.sys
Thermal Printer driver

Cor_W98.sys
CORINA driver for Windows 98

Files in Windows system directory:

CardioSoft requires the following files from the Windows system directory for Windows 98

hardlock.vxd
Hardlock Functions

ar200p.drv, ardll.dll
Thermal Printer Function for Windows 98

File name nomenclature of the examination procedure

The file name comprises the ID letter for the examination procedure (E: Ergometry, R: Resting ECG, S: spirometry, N: STAT (emergency) ECG, A: late potential analysis, B: ambulatory blood pressure measurement, H: Holter ECG, U: ultrasound, T: stress echocardiography, Y: X-ray, K: cardiac catheterization, X: external programs, Z: Right-Heart-Catheterization), the identification letter for the compression (C: compressed, U: uncompressed), the internal patient ID (6-digit with leading zeros) and the internal examination ID (3-digit with leading zeros), giving additional file data.

INI files

An initialization file CARDIO.INI is created in the Windows directory, where the program settings are stored. These settings can be allocated with an identifier and stored in the help functions under Settings in the \SETUP directory, thus making them available to all users of a network (load help functions under Settings). Up to 10 settings can be stored. The file names are SETUP0.INI to SETUP9.INI.

Entries in the initialization files SYSTEM.INI and WIN.INI are described in the corresponding sections of this Service Manual.

Stress test driver (ergometer, treadmill) settings are stored in the file PERM_MEM.DAT in the Windows directory. If the profiles are modified or recreated, this file should be saved. It has been known for this file to have been deleted during new installations. It can also prove useful to assign the file with the attribute READONLY. This prevents overwriting or deletion. However, this attribute must be removed again before making any new changes in the profile. It is more advisable, however, to make a backup of the file as it cannot then be lost, even in the event of a hard disk error.

5.2.12 Installation in the network

Network Configuration

To communicate with a MUSE server (Version 5.0a) you have to configure the TCP/IP protocol, if it isn't still installed on your CardioSys NT-Workstation:

1. Select taskbar -> Start -> Settings -> Control Panel.
2. Double-click on Network
3. Dependent on configuration on your domain server your station is a member of a workgroup or a member of a domain.
4. Select Tab "Services"
and add 'simple TCP/IP-Services', if it isn't displayed!
5. Select Tab "Protocols"
and add 'TCP/IP' if this protocol isn't displayed in the listbox yet!
6. Select TCP/IP and press 'properties...'
Tab "IP-address"
Check 'IP-address via DHCP-Protocol' if your domain server support DHCP,
or check 'use own IP-address' for specifying your own IP address, subnet
mask and default gateway address (don't play with these addresses!!!).
7. Tab "DNS"
Enter computer name of your CardioSys station, as well as the name of
the domain computer belongs to. Specify at least one IP address for your
DNS server.
Enter a domain suffix if you have one, that helps identify your computer
on the Internet.

8. Tab "WINS"
Enter correct IP-address for the primary WINS-Server. If the configuration in your network is using a secondary WINS-Server, do it as well.
Activate DNS for Windows. Normally LMHOSTS is obsolete if using DNS.
9. Tab "Routing"
Don't activate IP-forward routing
10. Press OK for updating TCP/IP
Press OK for updating bindings
and restart your system!!

Now with this, you have configured your network.

5.2.13 Administrator Passwords

Customer System or Network Administrator

User = Administrator → Password = NetAdmin

Service MHD only

User = MHDAdmin → Password = notnagel

Default User

User = Cardio → Password = cardio

5.2.14 Service screen

The service screen is accessed in the General Settings via the "For Hellige Service" key. The password is **helserv**. This contains the logbook listing the errors arising during the run period since the last program start. One can delete the logbook or save it for future reference under a different file name.

The CORINA time constants can be entered. A dictionary can be compared with the selected language using the help function "Test dictionary". The result appears in the logbook window. A service note can be entered on this screen.

You can start the utility to program the serial number in the CORINA from the service screen.

5.2.15 Option keys

The option keys are derived from the CORINA series number, which can be called up via the menu Help - Info on. Entering the series number, however, requires prior selection of an operating mode to initialize the CORINA (resting ECG, ergometry or emergency). The option keys are entered into WIN.INI under section [CARDIO].

| | |
|--------------|---|
| CFG_OptKey0 | SW Option: RESM:Rest ECG Measurement |
| CFG_OptKey1 | SW Option: RESI:Rest ECG interpretation |
| CFG_OptKey2 | SW Option: ERG1:Stress Test S |
| CFG_OptKey3 | SW Option: ERG2:Stress Test AT |
| CFG_OptKey4 | SW Option: ERGM:Send to RemoteTest Station |
| CFG_OptKey5 | SW Option: EGMO:Online ECG Storage |
| CFG_OptKey6 | SW Option: NETS:Storage in Network |
| CFG_OptKey7 | SW Option: RESB:Resting ECG basic features |
| CFG_OptKey8 | SW Option: ERG3:Stress Test Expert Mode |
| CFG_OptKey9 | SW Option: ESTA:Stress Test Stage Report |
| CFG_OptKey10 | SW Option: AVER:Late Potentials |
| CFG_OptKey11 | SW Option: EXAR:Process Task List |
| CFG_OptKey12 | SW Option: ERGX:USA Stress Test basic features |
| CFG_OptKey13 | SW Option: ERGA:USA Stress Test Arr. Annota. |
| CFG_OptKey14 | SW Option: ERGR:USA Stress Test extended analysis |
| CFG_OptKey15 | SW Option: REVM:Review Manager (Hardlock req'd) |
| CFG_OptKey16 | SW Option: ECGH:ECG History (Hardlock req'd) |
| CFG_OptKey17 | SW Option: CBOX:Cardio-Mailbox (Hardlock req'd) |

With regards to these options please also note the following:
option RESM operates only in conjunction with option RESB
option RESI operates only in conjunction with option RESM
option ERG3 operates only in conjunction with option ERG2

5.2.16 Data transfer to/from MUSE

Store Examinations for MUSE

Prerequisites: Network with correct installed TCP/IP specifications,
or Modem and RAS with installed TCP/IP, assuming
FTP or a shared directory will be used.

Each CardioSys have to use its unique Cart number as well as
the correct location number for generating an unique filename!

Tests on CardioSys can be transferred to MUSE database for general accessibility.
Three possibilities are implemented in CardioSys:

- a) Save Examinations on Floppy and carry it to MUSE
- b) Send Examinations to MUSE using FTP via LAN or RAS
- c) Store Examinations on a shared directory located on MUSE via LAN or RAS

The usual way for **MUSE 5.x** is FTP:

1. Specify the FTP account informations on CardioSys ->
System Configuration -> MUSE by enabling "Data transfer via FTP"
2. Type in the FTP Server (normally the same as the Web Server)
Use Username and Password if these informations are required
for the FTP Server.

For **MUSE 4.x** the preferred method will be the shared directory:

1. Specify the account informations on CardioSys ->
System Configuration -> MUSE by enabling "Data transfer via shared directory".
2. Type in the correct shared directory.
Use Username and Password if these informations are required
for accessing this shared directory.

Hint: Use an existing mapped network drive (f.e. "F:") as a synonym for
\\SvrName\SharePointName) already established from file manager
reconnected at logon time (not available if using a modem!), or use the
UNC Format in a valid form like "\\SvrName\SharePointName".
If no DNS/WINS is installed on the domain server (f.e. you're using RAS)
write "\\123.456.789.255\SharePointName" (all samples without quotes!),
where 123.456.789.255 is the physical IP address of the Server.

Transferring examinations to MUSE using FTP or shared directory, the connection
to the server can be established via local modem.

Enable "Start modem connection before transferring data" to use these RAS functionality.

Note: You have to configure the modem, RAS, phonebook, etc. in a separate step.

Modem/RAS Installation

Prerequisites: RAS access on MUSE-Server for required account.

Transferring Data from/to MUSE can be done via LAN or modem.

1. Select taskbar ->Start ->Settings ->Control Panel.
2. Doubleclick on "Modem" and follow the questions on the displayed dialogs.
Take attention in "Properties" ->"Call preferences" and disable "Wait for dial tone before dialing" if modem is linked in an Inhouse telephon compound.
3. Select taskbar ->Start ->Settings ->Control Panel.
4. Doubleclick on "Network"
5. Select Tab "Services", add "Remote Access Service" and confirm by "OK"
6. Choose "TCP/IP" protocol in Properties ->Network
7. Select taskbar ->Start ->Programs ->Accessories ->Dial-Up Networking
Describe your connectivity to the MUSE server modem.
8. Behind Advanced... ->change properties ->Tab "Server" select the correct type of server, protocol TCP/IP and the properties for this protocol

So far it's possible to establish a RAS connection for receiving patient and order information from MUSE, or for transferring examinations to MUSE.

(In advance you should confirm the configuration of RAS/Modem before you start a transfer in CardioSys. Use explorer.exe or winfile.exe after establishing a connection to a PC via RAS, and try to down-/upload some files)

Hint: The most problems occur with Dial-Up Networking ->Advanced... ->change properties ->Tab "Entries" ->Configuration... ->Modem compression and in combination with ->Tab "Server" ->Software compression, as well as with "LCP-Extensions for PPP" and in Tab "Security" with the correct encryption/certification by using Service Packs before Version 3.
The switches are dependent strongly on modem characteristics (on both sides) and on configuration of the integrated network with which you linked on it.

9. Connecting Internet Browser to MUSE via modem:

1. Select taskbar -> Start -> Settings -> Control Panel.
2. doubleclick on "Internet".
3. Open tab "Connection".
4. Activate "Connect via modem".
5. Confirm by "OK"

Patient database reading from MUSE

Prerequisites: Network with correct installed TCP/IP specifications

If you are using the MUSE database for selecting patients instead of the local database, you need an account on the MUSE server.

1. Specify the Web account informations on CardioSys -> System Configuration -> MUSE by enabling "Request MUSE data".
2. Type in Web Server, the Username and the Password
3. Select the correct MUSE site number.

Hint: For the MUSE servername specification you can use either the Internet name convention "http:\\www.myMuseSvr...", or the Intranet name convention "myMuseSvr", as well as a valid TCP/IP address in form of "123.456.789.255" (all samples without quotes!).

Configuration of Internet-Browser (IEExplorer)

Reading stored examinations from MUSE database, CardioSys requires an Internet Browser. Install IEExplorer V4.01 with Service Pack 2. Older versions of IE have some difficulties in working with MUSE.

Prerequisites: ServicePack 3 or above for WIN NT4.0
IEExplorer V4.01 SP 1 or above (SP 2 recommended)
MUSE version V5.0 or above
Acrobat Reader V3.0

1. Select taskbar -> Start -> Settings -> Control Panel.
2. doubleclick on "Internet".
3. Open tab "Connection".
4. Deactivate "Access via proxy server", but this depends on the configuration of the proxy server in your LAN. (if you have to use a proxy server, look furthermore in "Advanced Settings").
5. Activate "Connect to Internet via LAN" if connection is caused by LAN, otherwise active "Connect via modem".

6. Confirm by "OK"

Hint: Some changes of MS Explorer are working not before next restart of WIN NT!

5.2.17 PCI PC Bios

The following settings should be made in the BIOS of PCs with a PCI bus:

PCI configuration setup

PnP Bios Auto Config. Disabled

| | |
|-------------------|-----|
| 1st Available IRQ | N/A |
| 2nd Available IRQ | N/A |
| 3rd Available IRQ | N/A |
| 4th Available IRQ | N/A |

Other settings may lead to problems due to conflicts in interrupts.

5.3 Installation of the hardlock

If CardioSoft is run without CORINA, some of the options are locked with a hardlock. The hardlock used can be connected to the parallel or the serial interface.

Using an environment variable the program can be informed where to look for the hardlock. In the default setting a search for the hardlock is made at the interfaces LPT1 and LPT2 only. In addition, using these environment variables, certain PC configurations, which could lead to problems, can be indicated.

| Port Identification | Meaning: |
|--------------------------------|--|
| p = parallel | normal parallel port |
| s = serial | normal serial port |
| e = ECP | parallel port in ECP mode |
| n = NEC (Japan) | As the Japanese NEC models have a different port configuration, a special operation can be activated with this parameter. A separate NEC API is thus no longer necessary. |
| C = Compaq Contura Dockingbase | The dockingbase multiplexer (to toggle between the parallel port and Ethernet adapter) is reset on the parallel port to scan for the hardlock. |
| I = IBM PS/2 | The specification for IBM PS/2 rectifies an error in reprogramming the ports for certain video drivers under Windows (hardlock is no longer found after Windows has been started). This effect can now only be activated via the specification of the environment variables. |

Example:

in the file autoexec.bat

SET HL_SEARCH=378p, 2f8s

The hardlock is searched for at the parallel interface at address 0x378 and the serial interface at address 0x2f8.

If CORINA is connected to LPT1, the hardlock at LPT2 may not be identified. In this case use

SET HL_SEARCH=278p

to inform hardlock API that the search for LPT2 should commence. The ports are generally located at the following addresses:

| | |
|------|-----|
| COM1 | 3F8 |
| COM2 | 2F8 |
| COM3 | 3E8 |
| COM4 | 2E8 |
| LPT1 | 378 |
| LPT2 | 278 |

Under Windows 98, when using the hardlock the file hardlock.vxd must be located in the \system directory. It is copied there during the installation of CardioSoft

6 Instrument options

6.1 Hardware options

6.1.1 System PC 220 108 01

220 108 01 System PC (Pentium II, 350MHz), operating system optional

6.1.2 System PC options

701 180 72 Network card, PCI
2001967-001 SCSI Controller for MO and DAT streamer drive
384 018 07 3 1/2", 640 MB MO-Drive
384 018 75 2/4 GB DAT Streamer

6.1.3 System options

384 015 80 Network option (BNC, without network card)
384 017 33 Network option (TP, without network card)

6.1.4 Monitor

701 245 05 Monitor 15" (Type Mitsubishi SD 5904 C)
701 245 12 Monitor 17" (Type Mitsubishi TFV 8708)

6.1.5 PC Keyboard

701 246 01 Keyboard, German with card reader
701 247 01 Keyboard, German
701 247 02 Keyboard, English
701 247 03 Keyboard, French
701 247 04 Keyboard, Italian
701 247 05 Keyboard, Spanish

6.1.6 Function key keyboards

| | |
|------------|--|
| 220 092 06 | Function key keyboard Stress, German |
| 220 092 07 | Function key keyboard Stress, English |
| 220 092 08 | Function key keyboard Stress, French |
| 220 092 09 | Function key keyboard Stress, Italian |
| 220 092 10 | Function key keyboard Stress, Spanish |
| | |
| 220 093 06 | Function key keyboard Stress incl. barcode reader, German |
| 220 093 07 | Function key keyboard Stress incl. barcode reader, English |
| 220 093 08 | Function key keyboard Stress incl. barcode reader, French |
| 220 093 09 | Function key keyboard Stress incl. barcode reader, Italian |
| 220 093 10 | Function key keyboard Stress incl. barcode reader, Spanish |
| | |
| 220 092 21 | Function key keyboard Right-Heart Catheterization, German |
| 220 092 22 | Function key keyboard Right-Heart Catheterization, English |
| 220 092 23 | Function key keyboard Right-Heart Catheterization, French |
| 220 092 24 | Function key keyboard Right-Heart Catheterization, Italian |
| 220 092 25 | Function key keyboard Right-Heart Catheterization, Spanish |

6.1.7 Mouse

| | |
|------------|-------------|
| 701 181 34 | Mouse, PS/2 |
|------------|-------------|

6.1.8 Printer

| | |
|-------------|-----------------------------------|
| 701 242 79 | Laser-Printer EPSON EPL-5700 |
| 2000926-001 | Laser-Printer HP 2100 M (German) |
| 2000926-002 | Laser-Printer HP 2100 M (English) |
| 2000926-003 | Laser-Printer HP 2100 M (French) |

6.1.9 Connector cable T2000

Connector cable to treadmill T2000 (RS232/RS422)

Marquette:

700 607 -001

Marquette Hellige:

223 390 01

700609-001 (only RS232)

6.1.10 Connector cable Tram-Rac (MicroLab only)

| | |
|------------|-----------------|
| 223 398 01 | Connector cable |
| 217 332 01 | Dongle Tram-Rac |

6.1.11 Connecting an IPS (Interruption-free Power Supply)

The following IPS can be recommended:

| | |
|------------|----------------|
| CardioSys: | ESV5+ from MGE |
| MicroLab: | ESV8+ from MGE |

The IPS must be located outside the patient area. The IPS should be connected up to a permanent power supply. When CardioSys/MicroLab is switched off at the power socket the IPS will always discharge and may not reach its maximum capacity. Moreover, the printer should not be linked up via the IPS as this may lead the IPS becoming overloaded.

6.2 Software options

6.2.1 Application software

| | |
|------------|---|
| 455 022 01 | Basic software |
| 455 023 01 | Resting ECG measurement |
| 455 024 01 | Resting ECG interpretation |
| 455 025 01 | Ergometry S, 3-channel ECG |
| 455 026 01 | Ergometry AT |
| 455 027 01 | Online ECG storage, data management, data compression |
| 455 029 01 | Ergometry monitoring |
| 455 030 01 | Storage in the network |
| 455 032 01 | Ergometry expert mode |
| 455 033 01 | Ergometry direct printout |
| 455 034 01 | Request management |
| 455 035 01 | Late potential analysis |
| 455 039 01 | Review Manager |
| 455 040 01 | ECG History |
| 455 041 01 | Cardio-Mailbox |

7 Instrument versions

7.1 System cart CardioSys 202 306 ..

| Part No. | Rated line | Pump | Analog | Colour | Language |
|------------|------------|------|--------|--------|----------|
| 202 306 40 | 230V | no | no | grey | optional |
| 202 306 41 | 230V | yes | no | grey | optional |
| 202 306 42 | 230V | no | yes | grey | optional |
| 202 306 43 | 230V | yes | yes | grey | optional |
| 202 306 44 | 115V | no | no | grey | optional |
| 202 306 45 | 115V | no | yes | grey | optional |

202 306 44 /45 (115V versions) are not UL tested may not been used in the USA!

7.2 System cart MicroLab 202 316 ..

| Part No. | Rated line | Pump | Analog | Colour | Language |
|------------|------------|------|--------|--------|----------|
| 202 316 10 | 230V | no | no | grey | optional |
| 202 316 11 | 230V | yes | no | grey | optional |
| 202 316 12 | 230V | no | yes | grey | optional |
| 202 316 13 | 230V | yes | yes | grey | optional |

8 Troubleshooting tips

8.1 System Repair Kit

If you have very hard problems or system harddisk damage with your NT 4.0 installation on CardioSys or MicroLab, please order the SYSTEM REPAIR KIT (KIT REPAIR CSYS/MLAB NT4.0 2000766-001).

This CD based kit will give you the possibility to quickly reinstall and configure the NT4.0 system (all files on HDD C:) for CardioSys and MicroLab by image transfer from CD. This tool is only for restauration of the NT4.0 system, so you have to take care about recovering the patient data from HDD D:.

Please notify that both partitions of the harddisk (C: & D:) are formatted using the NTFS file system. So no MS-DOS based tool is capable to read or write within this partitions. A freeware read tool for MS-DOS is supplied within this repair kit.

After system installation please reinstall CardioSoft and use the SID-tool to create a new random SID for this system.

8.2 Frequently Asked Questions

Question: I see red lines on remote screen

Solution:

Set the TCP/IP Protocol Parameter MaxMTU to the value 512 of the sending PC (important of the sending PC)

For Windows NT 4.0:

With the Registry Editor please locate the following key:

"HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\<Adapter Name>\Parameters\Tcpip"

Where <Adapter Name> refers to the subkey for a network adapter that TCP/IP is bound to.

Please enter the key "MTU" with the Type "REG_DWORD" with the value 512.

After the change please reboot the System.

For Windows 95/98:

With the Registry Editor please locate the following key:

"HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Class\netTrans\000n"

Where 000n refers to the network adapter that TCP/IP is bound to.

Please enter the key "MaxMTU" with the Type "String" with the value "512" (Important: use Type "String" and enter the string "512").

After the change please reboot the System.

Question: CORINA is not detected at the LPT port:

Solution:

Set LPT Mode in BIOS to „NORMAL MODE“ (not to „ECP“ or „EPP“ Mode)

If this will not help, please use Multi I/O card from Hellige Service

(PN: 2000148-001)

There will be a new CORINA generation with better communication capabilities (CORINA V3.1). Because of the enhanced communication features, this new CORINA only will work with newer CardioSoft versions greater/equal V4.14

Question: I got the error message -115 when installing CardioSoft V4.1x

Solution:

The file that was displayed within the error message is write protected or the actual User do not have the rights to write to the destination directory. Change the readonly attribute for the file or the User's policies.

Question:

When I start CardioSoft, I get a data base error

Solution:

Copy new „REORG.BAT“ file from CardioSoft V4.1x directory to „DATABASE“ directory and start a reorganisation of the data base.

Question: When I open an examination I get a Decompression Error:

Solution:

Use Check and repair hard disk using SCANDISK or CHKDSK. Then restore the system By using the last BACKUP file.

Question: PCW130 value will not be displayed in the stress test measurement summary

Solution:

PCW 130 is not for use in combination with treadmill stress tests.

The stress test must be done, weight of the patient is existing and a heart rate of 130 was reached. (ECG equipment must have the capability for a heart rate of 130)

Question: The modem I use is not in the modem list and brings up an error message at initialisation

Solution:

Chose modem type „User defined“ and delete „\X1“ out of the field „Initialisation“.
After doing this the error message will disappear.
Configure modems type „MultiTech“ only with 14400 baud and 19.2K baud.
Use the newer MultiTech 56K with the modified modem type „User defined“

Question: Patient selection menu will not fit within the screen

Solution:

Select „SMALL FONTS“ within the display configuration window.

Question: The buttons on the screen have a grey shadow when using CardioSoft on a Windows 2000 based system (p.s. no CardioSys/Microlab issue)

Solution:

Select the scheme „Windows Classic“ under „Appearance“ in the display configuration window

8.3 Printer debugging

Symptom: **Printout incomplete**

The printer probably has insufficient memory.

Symptom: **EPSON EPL-5700 does not work at the Novell server**

The speed of the parallel interface in the configuration of the Epson EPL-5700 must be set on LOW.

Symptom: **AR200 does no formfeed**

When using CardioSoft version > 2.5 the AR200 per default does no formfeed before and after printing. You can override this by certain settings in the AR200.INI if you always want a formfeed. When the user has a function keyboard he can press the formfeed key to manually get a formfeed. If he has no function keyboard he can press the combination **Shift-Ctrl-9 (Shift-Strg-9)** on the PC keyboard.

Symptom: **NT 4.0, slowly printing with HP6P, HP2100M, HP4050M(only CardioSoft)**

Please replace the original printer driver with “HP Laserlet 5M” from the Windows NT Workstation CD ROM.

Symptom: **Windows 98 (only CardioSoft) EPL-5700 do not work properly**

Replace the original printer driver with the "EPL-5500"
(Problem: no landscape printout possible under Windows 98
with original printer driver)

Symptom: Laser Printer prints numbers instead of grid

There are three solutions for this issue:

- a) If you work within a network installation, make sure that CardioSoft is installed on every client that want's to work with this software.
- b) Open Printer properties menu and change the printer scheduling to „Print direct ..“
- c) Do the following entries to the WIN.INI, section [CARDIO]:
GRA_DontRemoveGrid=1

Symptom: While printing a Resting ECG on an EPL5500 printer, the lettering is printed over the sheet margins

Disable the „Advanced Printing Features“ under „Advanced Options“ in the printer configuration menu.

Symptom: Thermal printer AR200 prints black bars

The thermal printer has a internal overload.
Activate the Stop Print button and start with printing again.

Symptom: Paper out message from a laser printer is displayed delayed

You can reduce the Transmission Retry Timeout. This will decrease the delay of the displayed Paper out message, but it could case a timeout message during print of pages with noisy ECG curves.
Reduce the Transmission Retry Timeout in Windows NT Printer Settings (Tab "Port", button "Configure Port...").

8.4 Error messages from CardioSys

Below is a list of error messages from CardioSys arranged numerically, modes or certain functions having a specific number range. Many error messages are self-explanatory, requiring no further explanation. Wherever considered prudent, possible error sources or appropriate remedies are given.

8.4.1 Error messages [1xxx]: Patient management

- [1108] Enter heights between 1 cm and 300 cm only
- [1109] Enter heights between 1 in and 300 only
- [1110] Enter weights between 0.1 kg und 400.0 kg only
- [1111] Enter weights between 0.1 lb und 800.0 lb only
- [1112] Patient ID or family name, first name and date of birth must be entered
- [1113] Patient with this Patient ID already exists
- [1114] Hard disk full

- [1115] General data base error (No.%s)
An error occurred when entering a new patient into the data base file in the directory \cardio\database.
- Remedy:
- Restore examination data backup. However, when doing this all the examinations performed after this backup get lost !!!
- [1116] Date of birth should be entered in prescribed format
- [1132] Examination cannot be compared with itself!
- [1134] Error when accessing data base files
The data base files in directory \cardio\database have been damaged or deleted.
- Remedy:
- Restore examination data backup. However, when doing this all the examinations performed after this backup get lost !!!
- [1135] Error when accessing BDT file (%s)
The BDT file from the physician accounts program is unavailable or the directory given for this BDT file is incorrect.
- Remedy: Retrieval in physician accounts program improved.
- [1136] Error when reading from the BDT file in line %s
There is an error in the line given of the BDT file from the physician accounts program (e.g., field length is incorrect)
- Remedy:
- The physician accounts program must create BDT file correctly.
- [1138] Connection busy or not available
- [1142] No patient has been selected for the transfer of examination data
- [1145] Error when copying the examination
An error occurred when copying the examination from/onto storage medium. If copying onto a data carrier, then the data carrier was defective. If copying from a data carrier, the hard disk is full.
- Remedy:
- Using a non-defective data carrier or create free memory on the hard disk.
- [1149] Only capital letters (A to Z), numbers (0 to 9) and special characters (\$,/,.,+,-,%,space) can be used in patient IDs
- [1150] Another user is accessing this patient's data in the network
Another user is performing this examination.
- Remedy:
- Terminating the program at the other network stations.
 - If this error message appears even when no other network station is busy, exit program and delete file "network.btr" in the installation directory (e.g., Y:\CARDIO) in subdirectory "DATABASE".
- [1151] This examination is being performed by another network user
- [1152] Another user is accessing one of the patient's examinations in the network
[1153] Selected patient cannot be deleted.
- [1154] Selected examination does not exist
- [1155] Error when compressing data
The hard disk is full.
- Remedy:
- Create memory space on the hard disk, e.g., by storing examinations externally.

- [1156] Error when decompressing data
The selected examination file has been damaged.

Remedy:

- Restore examination data backup. However, when doing this all the examinations performed after this backup get lost !!!

- [1161] This function cannot be executed in combination with a physician accounts program

- [1162] This function cannot be executed in the DEMO version
The limitations of the DEMO version are described in the UM.

Remedy:

- Use complete version of the program.

- [1163] No patient selected for the examination by data carrier

- [1174] No Patient selected for the examination by ECG recorder

- [1176] Patient identification not clear. Patient data cannot be used.

- [1178] Software option request list unavailable

- [1180] No request for selected examination mode available

- [1181] Warning: Only the latest 20 examinations are displayed

- [1254] No examination selected

- [1517] No modem interface or modem busy

Mouse interface was selected.

Remedy. Select another interface.

- [1531] Defective initialization command for modem.

Wrong modem model selected.

- [1534] Distant end busy

Wrong dialing procedure programmed and telephone system gives engaged

- [1544] Error during data transmission

Bad telephone connection or no FIFO chip (16550) on serial interface

Remedy: Dial again; install FIFO chip.

8.4.2 Error messages [2xxx]: Help functions

- [2129] Wrong password entered

- [2135] Settings cannot be loaded

The INI file in the directory \cardio\setup has been damaged.

Remedy:

- Overwrite settings in this entry with new settings using the help function "Save Settings" (Warning: damaged settings are lost)

- [2136] Setting cannot be saved

The INI file in the directory \cardio\setup has been write-protected or the hard disk is full

Remedy:

- Disable INI file write protection in the directory \cardio\setup using the file manager or create memory space on the hard disk.

- [2144] Invalid date

- [2145] No examination fulfils compressing criterion

- [2147] No examination fulfils external storage criterion

- [2157] The examination on the data carrier is not from this program

- [2158] No examinations found on data carrier
- [2161] Another network user is making a sound recording
- [2166] The selected examination does not exist on the data carrier
- [2168] This function cannot be executed in the DEMO version
- [2169] Error whilst writing on the data carrier for external storage
- [2170] Error whilst reading from the data carrier for swapping in
- [2321] Maximum number of sound recordings attained

8.4.3 Error messages [3xxx]: Main program

- [3421] Path or file name not found!
- [3422] Error when executing the file:
- [3423] Insufficient free memory! Please terminate the program and Windows and then restart both. Further program execute commands may lead to errors!
- [3425] Insufficient free resources. Please terminate the program and Windows and then restart both. Further program execute commands may lead to errors!
- [3426] When operating an external recording mode a patient must be selected!
- [3428] No external operating mode configured for this examination!
- [3432] Error during transfer of DDE command!
- [3433] No examination data from external program!

8.4.4 Error messages [6xxx]: Resting ECG, Emergency

- [6060] Function inoperative as examination was not assigned to a patient.
- [6062] Message: Storage time [min:sec]
During an emergency recording, this displays how many minutes and seconds are still available on the hard disk to save the online ECG.
- [6100] CORINA not connected or not switched on!
The programm cannot establish any contact to CORINA.
Remedy:
 - Connect up CORINA power supply unit
 - Connect CORINA to an LPT on PC
 - Switch CORINA briefly off then on again (disconnect power unit) and try again
 - in BIOS change the parallel interface mode from 'Bidirectional' to 'AT or unidirectional'
- CORINA is inoperative with the parallel interface of IBM PSx PCs; these PCs require the additional installation of a normal parallel interface card
- [6271] No data available
- [6400] Message: "Recording" is only possible when you have the option "Resting ECG Basic Features"!
- [6467] At least one of the options "10-s ECG Analysis" or "Online Storage" must have been selected!
- [6480] Message: "Recording" is only possible when you have the option "Resting ECG Basic Features"! or "Online ECG Storage"!
- [6494] The maximum limit for %d lines has been reached!

- [6508] Error when opening signal processing
- [6509] Internal CORINA error
CORINA has detected an internal error during the self-test.
- Remedy:
- Replace CORINA
- [6510] Error when retrieving the examination data
The content of the examination file has probably been damaged.
- Remedy:
- Restore examination data backup. However, when doing this all the examinations made after this backup get lost !!!
- [6511] Error when retrieving control data
see error message [6510]
- [6515] Message: "Interpretation" is only possible when you have the option "Measurement"!
- [6517] There is too little space on your hard disk to save this recording
- [6518] Error whilst saving the online ECG
When saving the data an error occurred on the hard disk. (Disk full or damaged)
- [6539] Message: "Save" is only possible when you have the option "Network"!
- [6540] Error when writing the examination data
The hard disk is probably damaged or full. The examination must be repeated.
- [6545] Function disabled: another user is changing the interpretation
- [6546] Function disabled: another user is performing a reanalysis
- [6547] Function disabled: another user is viewing this examination
- [6548] Function disabled: another user is entering a comment on this examination
- [6549] Message: The channel designation for both recordings differs. A comparison of corresponding channels is thus not possible!
- [6555] Error during CORINA downloading
An error occurred when updating internal CORINA software.
- Remedy:
- Restart program
- [6556] CORINA error: data transmission
Errors occurred during data transmission from CORINA to the PC
- Remedy:
- Check connection from CORINA to PC

8.4.5 Error messages [7xxx]: Ergometry

- [07327] Error when retrieving the examination
Examination file damaged.
- Remedy:
- Restore examination data backup. However, when doing this all the examinations made after this backup are lost !!!
- [07436] Max. number of characters per line exceeded
- [07438] Max. number of lines exceeded
- [07654] Number of load parameters too high!
- [07655] No further load stage possible!
- [07656] Load profile cannot be modified!

There are permanent and adjustable load profiles in the ergometer.
Permanent load profiles cannot be modified or deleted.

Remedy:

- Load a permanent load profile and press the "new" key. This copies the permanent profile and can now be modified and saved under a new name.

[07657] Load profile cannot be modified!

[07961] NetBios driver not loaded!

The NetBios driver must be loaded in the ergometry recording station and the slave screen station to enable the ergometry slave screen function.

Remedy:

- Load NetBios driver before starting Windows and CardioSys/CardioSoft

[07962] No station name entered in General Settings!

To enable the ergometry slave screen function an unambiguous station name for all ergometry recording stations and ergometry slave screen stations must be entered under General Settings in the network.

Remedy:

- Enter unambiguous station name under General Settings in the network

[07963] No connection to ergometer / blood pressure meter!

There is no connection between the ergometer and the PC.

Remedy:

- Has the correct connection cable been used
- Is the cable connected up correctly
- Is the ergometer switched on
- Is the ergometer a Marquette Hellige ergometer (ID)

[07964] CORINA not connected or not switched on!

see error message [6100]

[07965] Insufficient free memory on hard disk!

The hard disk does not have enough free memory space. CardioSys already includes a certain number of bytes in hand.

Remedy:

- Make memory space available on the hard disk, if necessary, store examinations externally
- If online ECG has been configured, the memory requirement can be reduced by disabling this option.

[07966] Error when saving the examination!

An error has occurred when saving the examination on the hard disk.

[07967] Error when saving the online ECG!

An error has occurred when online saving ECG data on the hard disk.

[07983] No ergometry software option available!

No software option was procured for the selected action. Ergometry cannot be called up.

Remedy:

- Purchase Ergometry software option

- Check option code number under General Settings, options for ergometry and correct if necessary.

- [07984] Storage only possible when you have the network option!
The examination can only be saved on the network server when the network software option has been purchased.
Remedy:
- Operate program locally
 - Purchase network software option
- [07993] Error in CORINA data transmission!
see error message [6556]
- [07994] Error in CORINA downloading!
see error message [6555]
- [07995] Internal CORINA error!
see error message [6509]
- [07996] Error when opening network
An error has occurred when logging into the NetBios network.
Remedy:
- This error can occur after entering a valid station name and the network monitoring system has been activated during ergometry recording. When the ergometry recording is called up and the program CardioSys/ CardioSoft is terminated immediately afterwards, the next time the ergometry recording mode is called up this leads to this error. If the system is switched off after quitting the program and switched on again, this error does not occur. This error can also be 'repaired' by entering a new station name in the interim. The error only occurs when less than approx. 10 have passed between calling up the ergometry recording and terminating the program. Cannot be corrected by technical means!

8.4.6 Error messages [8xxx]: Spirometry

- [8525] The examination has not been assigned to a patient; thus, it is not possible to enter an interpretation!
- [8543] Read examination file: Error when opening file
The examination file does not exist or the user does not have any read rights (can only occur in network).
The rights of the user in the network should be checked. If the user has read rights for the subdirectories with the examination data (as a rule he should have read and write rights for the CardioSoft installation directory, including all the subdirectories) or CardioSoft is installed locally, the examination file has been deleted or the data base damaged.
Remedy:
- Restore examination data backup. However, when doing this all the examinations performed after this backup get lost !!!
 - Under NetWare flag is not set on S (Sharable). See NetWare Documentation.
- [8544] Read examination file: No spirometry file
The data base has probably been damaged.

Remedy:

- Restore examination data backup. However, when doing this all the examinations performed after this backup get lost !!!

[8545] Read examination file : Error when retrieving the file
The content of the examination file has probably been damaged.

Remedy:

- Restore examination data backup. However, when doing this all the examinations performed after this backup are lost !!!

[8551] Respiratory flow sensor not connected to selected interface or switched off

Remedy:

- Check whether the respiratory flow sensor is switched on. If it is switched on, check whether the respiratory flow sensor is connected to the correct interface. If both are OK, the respiratory flow sensor or the interface could be defective.

8.4.7 Error messages [10xxx]: Ergometry monitoring

[10427] No (further) ergometry for monitoring available!

[10428] Ergometry test terminated!

8.4.8 Error messages [11xxx]: Printer tools

[11007] Error when initializing the print job
Possibly too little space free in main memory.

Remedy:

- Exit Windows and restart.

[11008] Error when starting the print job
Too little space in main memory to transmit the print data (spooling).

Remedy:

- Exit Windows and restart.

8.4.9 Error messages [12xxxx]: Printer tools

[12064] Local printer is not ready!

[12065] No ST measurement at this time!

[12066] Error when starting the print job!

[12500] Error when saving the episode

8.4.10 Error messages [13xxx]: Long-term blood pressure

[13130] Error when initializing the interface!
Occurs when the configured interface is already busy, for example.

Remedy:

- Select another free COM interface.

[13228] Error during data transmission from/to TONOPORT

Remedy:

- Check TONOPORT - CardioSys connection. Is TONOPORT switched on and is battery still sufficiently charged?

- [13236] No examination data are stored on recorder!
Examination data retrieval only possible when a recording was made with TONOPORT.
- [13237] Number of retrieved data defective!
Data transmission from TONOPORT to CardioSys was defective.
Remedy:
- Retrieve examination data a second time
- [13238] Error when retrieving the file "LBD_TEST.PAT" in the program directory!
Test patient data are stored in the file "LBD_TEST.PAT" in the program directory. The file is either damaged or does not exist.

Remedy:
- Check hard disk.
- [13239] Error when saving examination!
A hard disk error has occurred when saving the examination.
Remedy:
- Check hard disk.
- [13241] Error when retrieving the examination file!
The examination file is damaged
Remedy:
- Restore examination data backup. However, when doing this all the examinations performed after this backup get lost !!!
- [13243] Programing not possible, recorder still has stored examination data!
The TONOPORT recorder can only be programmed when it does not have any stored examination data.
Remedy:
- Clear TONOPORT data memory
- [13274] Not all data could be downloaded. Patient monitor was too often turned on and off!
The TONOPORT recorder was more than 15 times switched off and on again.

8.4.11 Error messages [14xxx]: Late potentials

- [14055] Recording only possible when you have the option 'AVER: Late Potentials'.

8.4.12 Error messages [15xxxx]: General tools

- [15004] Error when opening signal processing
- [15005] CORINA error: data transmission
see error message [6556]
- [15008] Message: "Saving" is only possible when you have the option "Network"!
- [15009] Insufficient free memory space on hard disk
- [15011] Internal CORINA error
see error message [6509]

- [15012] Error during CORINA downloading
see error message [6555]
- [15013] CORINA not connected or not switched on!
see error message [6100]
- [15076] Function disabled as the examination was not assigned to a patient
- [15111] Access to examination in the network denied

8.4.13 Error messages [16xxx]: Tonoport

- [16807] Error 01: Memory is full
- [16808] Error 02: Battery is empty
- [16809] Error 03: Measuring period has elapsed
- [16810] Error 05: Micro withdrawn during blood pressure measurement
- [16811] Error 06: Pumping period has elapsed
- [16812] Error 07: Pump should not pump higher
- [16813] Error 08: 200 blood pressure measurements taken
- [16814] Error 10: Internal error in diastole identification
- [16815] Error 14: Diastole under 50 mmHg
- [16816] Error 15: Patient movement artefact during diastole identification
- [16817] Error 18: Systole outside measurement range
- [16818] Error 19: Diastole outside measurement range
- [16819] Error 21: Difference systole - diastole too small (10 mmHg)
- [16820] Error 22: Too many patient movement artefacts during systole identification
- [16821] Error 24: Systole identification period has elapsed
- [16822] Error 26: Systole under 70 mmHg
- [16823] Error 27: Systole over 250 mmHg
- [16824] Error 29: Too few oscillations identified (apply cuff more tightly)

8.4.14 Error messages [17xxx]: Right-heart catheterization

- [17619] TramNet connection defective
Connector cable has become disconnected or is defective, Tram-Rac not switched on
- [17620] Communication error to the RAC
Connector cable defective, malfunction on interface card or Tram-Rac
- [17621] Module sequence incorrect
Modules have been inserted into the Tram-Rac in the incorrect sequence
- [17622] Module missing or pulled out
- [17623] Sensor missing
Sensor not connected to the module (all modules).
- [17624] Check sensor
- [17625] Thermistor for injectate defective
only for HMV
- [17626] Baseline outside limits
PRESS only; zero offset too large

- [17627] Zero adjustment not possible
PRESS only; signal is too unstable
- [17628] Sensor unconnected
- [17629] Interference in signal/course of the curve

- [17630] Trigger point cannot be found
for HMV only; injection must be made within 20 s and the duration of actual
injection must not exceed 4 s
- [17631] Basal blood temperature fluctuates
- [17632] Incorrect injectate temperature
- [17633] Signal modulation too small
for blood pressure and pulse rate;
- [17655] Incorrect blood temperature

8.5 General Troubleshooting

- Stress test driver settings lost

Stress test profiles were changed or newly created and are no longer there.

Remedy: The file PERM_MEM.DAT in the Windows directory was inadvertently deleted or overwritten. A backup of this file should be made after changing profiles so that it can be restored even after a hard disk error (restore file into Windows directory).

- Defective data sets in the database

Errors occur during patient selection, but not when selecting examination options.

Remedy: Contact technical support for a reorganisation tool, which may repair the error in the data base.

By activating the REORG procedure you can reorganize defective BTRIEVE files from CardioSoft. This repair procedure may become necessary when the data become damaged for some reason or another (e.g. after a power failure). To carry out the repair procedure successfully, CardioSys must first of all be terminated. There must be sufficient memory space on your hard disk.

As a general rule, the following applies:

memory space required = twice as much free memory space as the sum of all
The original CardioSys files are still available in the form of "OLD" files after reorganization and should only be deleted when the reorganization has been completed successfully.

If the reorganization is unsuccessful, the only option remaining is to retrieve the latest backup data.

- There are problems with my printer, since I connected CORINA to the system

CardioSoft normally checks all LPT ports to detect the CORINA acquisition box. If the connected printer has problems with this access and you have CardioSoft V4.14 or greater, there is a possibility to fix this problem.

Remedy: Open WIN.INI and write in section [CARDIO] WCO_CorinaLptPort=x where x is the number of the LPT Port, CORINA is connected to. If you define PortNo. 0, the detection for CORINA will be disabled. This could be necessary on View and Edit stations, if there are problems with the printer after starting CardioSoft.

- Error when reading examinations, examinations get lost

Error messages when calling up examinations from the archive or examinations no longer there.

Remedy: There are two causes which may lead to the loss of data on hard disks. One is a read error on the disk, the second is the destructive influence of some viruses. Indications of a defective hard disk sometimes exhibit themselves as reading errors in certain sectors. The number of defective sectors increases with time. Such a hard disk must be replaced.

- Patient locked, although only called up from one work station

A patient in the network is locked, although they are only called up from one work station. This error occurs only occurs when the program crashes or after switching off the PC without having terminated CardioSoft beforehand.

Remedy: Delete the file network.btr and station.btr in the subdirectory \database of the CardioSoft directory. Please be sure that CardioSoft is not running from any workstation.

- Monitoring stress tests

Attempt to monitor a stress test from two stations at the same time.

Remedy: None! A stress test currently being performed can be monitored from one station only at any one time.

- Swapping out examinations

Almost simultaneous swap-out at several stations; examinations are destroyed.

Remedy: None! Refer to Device Manual.

- Transferring examinations to data media

When an examination is transferred to another data medium, naming a subdirectory with an umlaut (ä,ö,ü..), the examination cannot be retrieved.

Remedy: Create subdirectories without umlauts.

It is not possible to transfer more than 512 examinations into the root directory of a data medium as DOS is only able to manage a maximum of 512 files on this medium. If more examinations are to be transferred, a subdirectory must be created. The number of files there is practically unlimited.

- Blood pressure display cut off

In the operating modes late potentials and ergometry the blood pressure display can be cut off, especially when the diastolic value is a 3-figure number (only in the case of monitors > 17" and VGA or 800 x 600 resolution).

Remedy: Select higher resolution (800 x 600 or 1024 x 768 or higher).

- No connection to ergometer

Stress test performed in German with EC 1200 and BD2 (BOSO), was correct. Language option French selected and start: no command sent to ergometer. Command comes only after calling up stress test a second time.

Remedy: After switching to a new language option terminate the program and restart.

- No connection to ergometer Ergoline 900

Remedy: Use of Version "752" or "M345" with OEM 4 Buttons or Version "236"/"436" in Program 10 with original 25 Button Ergoline.

- No RAS connection with ELSA Modem

Pulse dialing is not supported from ELSA 33.6 TQV Modem

Remedy: Select Tone Dialing.

- Modem RAS connection is not started

In MUSE Settings of System Configuration of CardioSys is activated "Start Modem connection before transfer", but the connection is not started. Please do not start manually the Modem RAS connection, when you configure that the application should start the connection.

Remedy: Terminate the manually started Modem RAS connection.

- Not enough memory space when compromising examinations

When compromising examinations and using a Hard Disk >4.3GB the following message will occur that less than 15% of storage medium is free.

Remedy: Set the percentage of storage medium in CardioSys
Tab "System Configuration", Button "Database" to 1 %

- Wrong Start of Right Heart Catheterization

After installing Microlab and reboot again you should wait until the pc-card is loaded from a DOS-window, before starting Microlab.

Remedy: If you don't wait and you start Microlab before the pc-card is loaded, the Right heart catheterization cannot be started. In this case you must Reboot the system again.

- Thermal printer AR200 prints 10mm-plateau or 10mm-gap(25mm/s)

This is a sporadic problem and should occur only in a network-installation.
The online curves are ok.

Remedy: Check the server. If you are not shure, check the online-curves.

8.6 System diagnosis with Windows98/NT

Windows 98: Use the tab "System Information" under the Tab
"Start - Programs – Accessories – Tools"

Windows NT: Use the tab "Event Viewer" or "Windows NT Diagnostics" under Tab
"Start – Programs – Administrative Tools"

9 Care and maintenance

9.1 Technical inspections

Technical inspections are to be performed once a year. The following items, including the accessories used, are to be performed:

- Check device and accessories for mechanical defects which impair their function.
- Check labels and inscriptions on the device relating to safety are clearly legible.
- Perform a function check
- Measure the resistance of the non-fused earth conductor as per measuring circuit from VDE 0751:1990
- Measure the device leakage current as per measuring circuit from VDE 0751:1990
- Measure the patient leakage current as per measuring circuit from VDE 0751:1990

Warning!

The following checks may only be performed by persons whose training, knowledge and practical experience enable them to carry out such checks reliably and correctly.

Notes:

The operational and functional reliability of the device is checked using the following checklists.

They serve the experienced technician when checking the device.

A knowledge of device operation as detailed in the "User's Manual" is assumed.

The checklist items are based on the testing instruments given below.

The tests should be carried out using the customer's accessories, so that defective accessories are also detected automatically.

If other testing instruments are used besides those mentioned, the items on the checklist and tolerance specifications may need to be modified.

9.1.1 Visual check

Device and accessories are to be checked to ensure that

- fuse cartridges comply with vendor's specifications;
- labels and inscriptions on the device relating to safety are clearly legible;
- the mechanical state of the device permits its further use;
- there is no fouling which could cause any reduction in safety.

9.1.2 Test functions

Recommended testing instruments and accessories

- 1x Multi-parameter simulator Lionheard
- 1x Customer patient cable or one brought along

Test preparations

Connect Cardiosort/CardioSys up to the mains and switch it on. In the case of CardioSys the program should start automatically. In the case of CardioSoft it may be necessary to start Windows and CardioSoft manually. In the help function menu select General test patient settings.

Testing the function key keyboard

In as far as it is possible test the function of all the keys on the function key keyboard (where available). When pressed each key should activate the correspondingly assigned function.

Analysis of the ECG signals and HR value

In the help function menu disable General test patient settings. Carry out the following settings on the ECG simulator:

- Amplitude 1 mV
- Heart rate (RATE) 60 bpm

Connect the electrode leads as indicated below:

- | | | | |
|----|--------------|--------|----|
| R | red | -----> | RA |
| L | yellow | -----> | LA |
| F | green | -----> | LL |
| N | black | -----> | RL |
| C1 | white/red | -----> | V1 |
| : | : | : | |
| C6 | white/violet | -----> | V6 |

Record a resting ECG and display the results on the screen. Check for quality and completeness.

Pacemaker identification test

Make the following settings on the multifunction simulator:

- pace setting
- pace amplitude 6 mV
- pace duration 0.2 ms

Record a rest ECG and display the results on the screen. Check for quality and completeness. The pace pulses must be visible as needles on the recording output.

Identification of disconnected electrodes

Reset the simulator to ECG signal at a heart rate of 60 bpm. Remove one electrode after the other from the ECG transmitter.

Call up the resting ECG recording screen. Check to ensure that each disconnected electrode is displayed correctly and that an acoustic alarm signal sounds (check beforehand that the acoustic electrode alarm signal is enabled.)

9.2 Safety Analysis Test

9.2.1 General introduction

The suggested Safety Analysis Tests refer to the international standard IEC 601-1. The tests are generally performed with Safety Testers, on most of them, the measuring circuits according IEC 601 are already implemented.

The following is a general description of the tests to be performed. For the handling of your Safety Tester follow the user manual.

The tests may be performed under normal ambient conditions of temperature, humidity and pressure and with line voltage.

The leakage currents correspond to 110 % of rated voltage for the tested unit. Most Safety Testers take this into account, otherwise the measured values have to be calculated.

9.2.2 Recommended Test Equipment

- Safety Tester for measurements according to IEC 601.
- Testing connector according to the following description.

9.2.3 Protective Earth Resistance Test

The power cord is to be included in the protective earth resistance test.

This test determines whether the device has a power ground fault.

- The protective earth resistance from power connector to any protective earth connected exposed conductive part is measured.
- Specs. of test circuit: AC current source 50 Hz/60 Hz of at least 10 A up to 25 A with limited output voltage of 6 V.
- If resistance is greater than 100 mOhm , the unit fails this test.

9.2.4 Leakage Current Measurement

To perform the suggested measurements, the unit under test has to be separated from any interconnection to a system. If the unit is part of a system, extended tests according to IEC 601-1-1 have to be performed. The following diagram shows the Measuring Circuit [M] reference for leakage current. The reading in mV corresponds to μA (leakage current). The Safety Testers generally work with this Measuring Circuit [M] and the displayed values are already converted to leakage current.

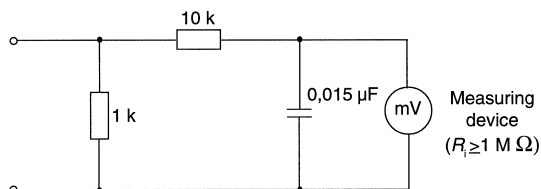
9.2.4.1 Enclosure Leakage Current Test

This test is performed to measure leakage current from chassis to ground during normal conditions (N.C.) and single fault conditions (S.F.C.).

In all cases, the leakage current is measured from any exposed conductive parts to ground, the unit under test has to be switched on and off.

Connect the unit under test to your Safety Tester.

- During normal conditions (N.C.), referring to the electrical diagram, measurements have to be done under the following conditions:



- * Polarity switch Norm and RVS
- * GND switch GND closed
- * S1 closed and open

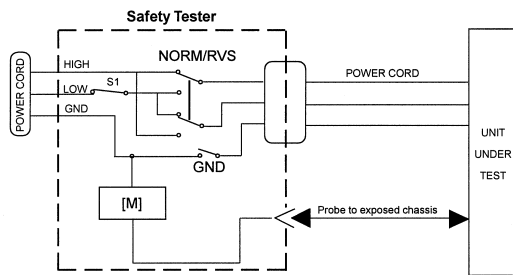
- During single fault conditions (S.F.C.), referring to the electrical diagram, the measurements have to be done under the

following conditions:

- * Polarity switch NORM and RVS
- * GND switch GND open
- * S1 closed

| N.C. | S.F.C |
|-------------------|---------------------------------------|
| 100 μA | 500 μA |
| | 300 μA (U.L. requirements) |

Electrical Diagram for Enclosure Leakage Current Test



9.2.4.2 Patient Leakage Current Test

This test performs a leakage current test under single fault conditions (S.F.C.) depending on domestic power outlet with 115 or 230 V AC as source into the floating inputs.

CardioSys : ECG

Modules in the Tram-rac:

BP/CO/Temperature Modules: refer to Service Manual

Document Part Number 403798-005

Solar SpO2 Module: refer to Service Manual

Document Part Number 414993-033

In all cases, the leakage current is measured from input jack, of unit under test, to ground.

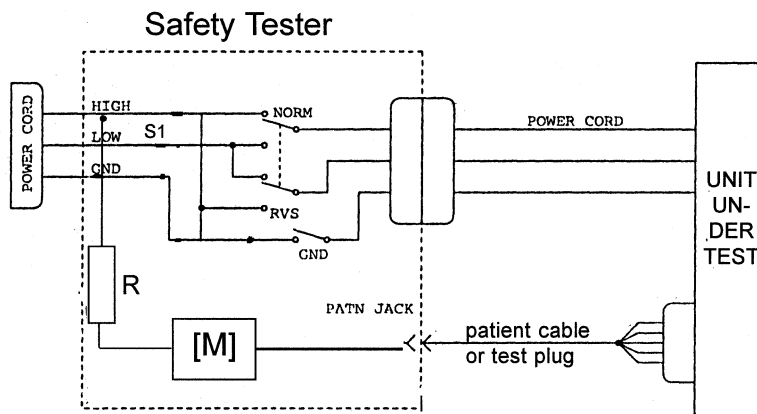
Connect the unit under test to your Safety Tester.

- Referring to the electrical diagram, measurements have to be done under the following conditions:

- * Polarity switch NORM and RVS
- * GND switch GND closed
- * S1 closed

Test has failed if the measured values are greater than 50 μ A

Electrical Diagram for Patient Leakage Current Test



For protection of the test person, the following values of resistor R may be used:

| | |
|--------|-------------------------|
| Typ BF | 22 kOhm (120 to 130 V) |
| | 47 kOhm (220 to 240 V) |
| Typ CF | 100 kOhm (220 to 240 V) |

9.3 Maintenance, cleaning, disinfection

CardioSys maintenance, cleaning, disinfection is performed in accordance with the User's Manual.

10 Jumper tables

10.1 MOTHERBOARD INTEL SE440BX

Only for first startup and for some special configuration CONFIGURATION JUMPER BLOCK J8A1 settings must be changed to fix CPU speed to 350MHz or to clear passwords. See Appendix SE440BX Motherboard Product Guide Page.

10.2 Multi I/O Interface Card

AT bus, No PNP Card. The card must be configured as follows:

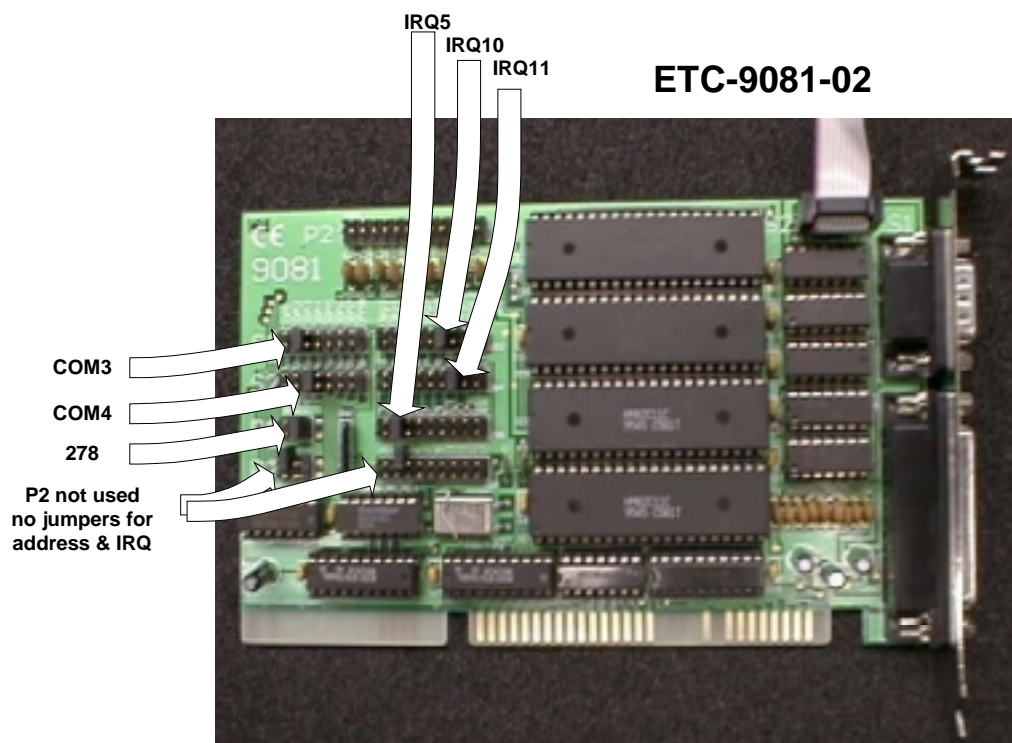
Type: ETC-9081-02

S1 COM3 IRQ10

S2 COM4 IRQ11

P1 278 IRQ5

P2 no jumpers / not used



10.3 VGA card

AGP bus, PNP Card, no manual configuration

Type: MATROX G100, 8MB



10.4 Network Card

PCI bus, PNP Card, no manual configuration

Type: 3COM 3C900B, ETHERLINK XL



10.5 SCSI Card

PCI bus, PNP Card, no manual configuration

Type: Adaptec AHA-2904



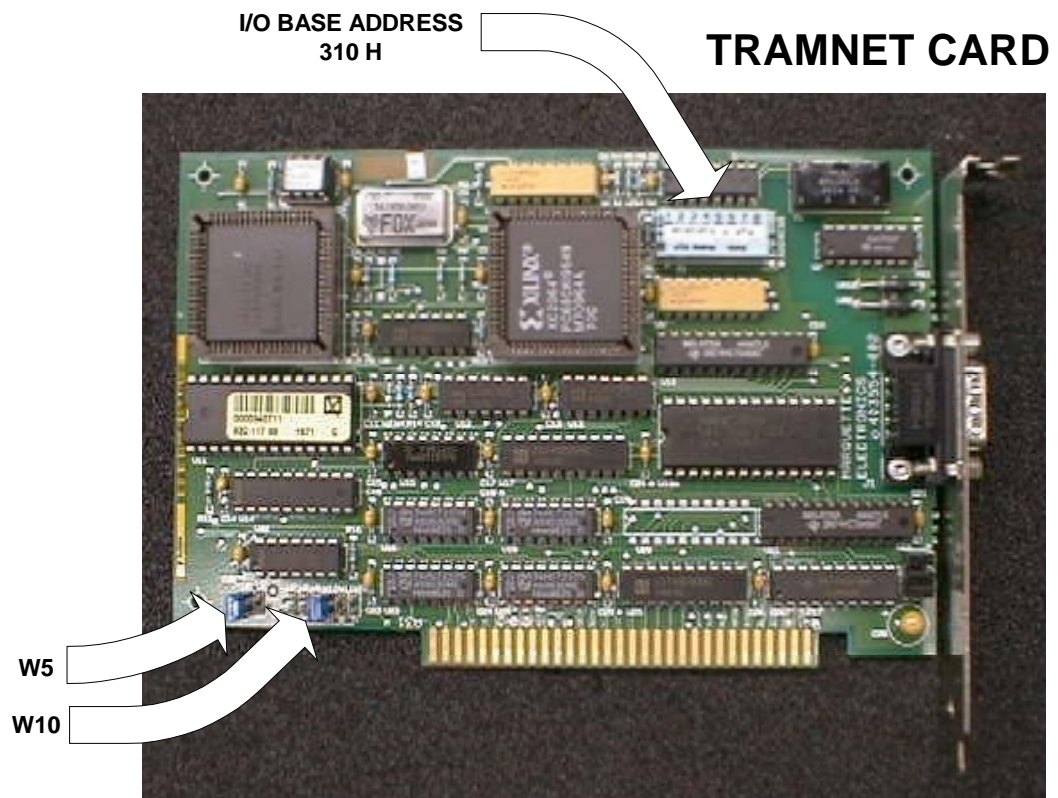
SCSI-IDs:

- 0 HDD
- 1 HDD
- 2 HDD
- 3 HDD
- 4 MO-Drive
- 5 RESERVED
- 6 DAT Streamer

10.6 TRAMNET Card (optional)

AT Bus, no PNP card.

I/O Base: 310
IRQ: 5
RAM Base D000



The card is equipped with 32k dual-port RAM.
TRAM-NET interface: 9-pin connector, male

Bridge configuration:

W5: closed (32k)
W6: open

W7: open (IRQ 2)
W8: open (IRQ 3)
W9: open (IRQ 4)
W10: closed (IRQ 5)
W11: open (IRQ 6)
W12: open (IRQ 7)

Microswitch:

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|-----|---|---|---|---|---|---|---|---|
| On | | ○ | ○ | ○ | | | ○ | |
| Off | ○ | | | | ○ | ○ | | ○ |

Address 310

11 Specifications

Power supply

From the mains, instrument assembly in Protection Class I acc. IEC 601-1

230V version:

- * rated voltage range 220V...240V
- * operating voltage range 198V...264V, 47Hz...63Hz
- * rated current with 17" monitor 1.5A
- * power take-up typically
 - w/o monitor 60W
 - with 15" monitor 140W
 - with 17" monitor 150W

115V version:

- * rated voltage range 110V...120V
- * operating voltage range 98V...132V, 47Hz...63Hz
- * rated current with 17" monitor 2.5A
- * power take-up typically
 - w/o monitor 60W
 - with 15" monitor 120W
 - with 17" monitor 130W

MicroLab:

230V version:

- * rated voltage range 220 V...240 V
- * operating voltage range 198 V...264 V, 47 Hz...63 Hz
- * rated current with 17" monitor 2.3 A
- * power take-up typically
 - w/o monitor 100 W
 - with 15" monitor 200 W
 - with 17" monitor 220 W

115V version:

- * rated voltage range 110 V...120 V
- * operating voltage range 98 V...132 V, 47 Hz...63 Hz
- * rated current with 17" monitor 4 A
- * power take-up typically
 - w/o monitor 140 W
 - with 15" monitor 180 W
 - with 17" monitor 200 W

Ambient conditions

Operation:

- * ambient temperature between +10 and +40 °C
- * relative humidity between 30 and 75 %
- * atmospheric pressure between 700 and 1060 hPa

Storage and transportation:

- * ambient temperature between -30 and +60 °C
- * relative humidity between 20 and 95 %
- * atmospheric pressure between 500 and 1060 hPa

Dimensions and weight

- * height 1150 mm
- * width 680 mm (MicroLab 740 mm)
- * depth 825 mm
- * weight 60 kg (w/o monitor and printer)

12 Spare parts list

CardioSys/MicroLab (Windows NT) Documentation

| | |
|----------|---------------------------------------|
| 22749801 | Operation Manual CardioSys V4.1 (d) |
| 22749802 | Operation Manual CardioSys V4.1 (e) |
| 22749803 | Operation Manual CardioSys V4.1 (f) |
| 22749805 | Operation Manual CardioSys V4.1 (it) |
| 22749806 | Operation Manual CardioSys V4.1 (sp) |
| 22749807 | Operation Manual CardioSys V4.1 (swe) |
| 22749808 | Operation Manual CardioSys V4.1 (rus) |
| 22749809 | Operation Manual CardioSys V4.1 (ung) |
| 22749810 | Operation Manual CardioSys V4.1 (pol) |
| 22749811 | Operation Manual CardioSys V4.1 (fin) |
| 22749812 | Operation Manual CardioSys V4.1 (nl) |
| 22749813 | Operation Manual CardioSys V4.1 (dan) |
| 22749814 | Operation Manual CardioSys V4.1 (nor) |
| 22749601 | Operating Manual MicroLab V4.1 (d) |
| 22749602 | Operating Manual MicroLab V4.1 (e) |
| 22749603 | Operating Manual MicroLab V4.1 (f) |
| 22749605 | Operating Manual MicroLab V4.1 (it) |
| 22749606 | Operating Manual MicroLab V4.1 (sp) |

Periphery

| | |
|----------|--|
| 22009206 | Function key keyboard Stress, German |
| 22009207 | Function key keyboard Stress, English |
| 22009208 | Function key keyboard Stress, French |
| 22009209 | Function key keyboard Stress, Italian |
| 22009210 | Function key keyboard Stress, Spanish |
| 22009306 | Function key keyboard Stress incl. barcode reader, German |
| 22009307 | Function key keyboard Stress incl. barcode reader, English |
| 22009308 | Function key keyboard Stress incl. barcode reader, French |
| 22009309 | Function key keyboard Stress incl. barcode reader, Italian |
| 22009310 | Function key keyboard Stress incl. barcode reader, Spanish |
| 22009221 | Function key keyboard Right-Heart Catheterization, German |
| 22009222 | Function key keyboard Right-Heart Catheterization, English |

| | |
|----------|--|
| 22009223 | Function key keyboard Right-Heart Catheterization, French |
| 22009224 | Function key keyboard Right-Heart Catheterization, Italian |
| 22009225 | Function key keyboard Right-Heart Catheterization, Spanish |
| | |
| 91541811 | Adapter, AT- Keyboard to PC- PS/2 |
| 70124701 | PC Keyboard German |
| 70124702 | PC Keyboard English |
| 70124703 | PC Keyboard French |
| 70124704 | PC Keyboard Italian |
| 70124705 | PC Keyboard Spanish |
| 70124601 | PC Keyboard with integrated patient card reader, German |
| | |
| 70118134 | Mouse, PS/2 with three buttons |
| 91541812 | Interface- Adapterplug 9- pin -- 25- pin |
| 50465751 | Holder for Respiration-Flow Sensor LF 501 (for CardioSys / MicroLab) |
| 50465752 | Holder ES500, KISS for CardioSys / MicroLab |

Computer Components

| | |
|-----------------|---|
| 22010801 | <i>Computer Assy Pentium II for CardioSys / MicroLab</i> |
| 30344660 | PC Housing ATX |
| 30344747 | Power Cable |
| 30344748 | Softstart Cable |
| 43051288 | Adhesive Label, D=10 |
| 43051785 | Typ Label, 49,5 x 37,5 |
| 43105948 | Fastener for potential equalisation |
| 50465966 | Sheet metal |
| 50466057 | Aperture |
| 80177627 | SCR DIN7981-ST2,9x6,5-F-Z-A2F (ISO7049) |
| 80177640 | SCR DIN7985-M3x8-4.8-Z-A2F (ISO7045) |
| 80403200 | WSHR DIN125-3,2-140HV-A2F |
| 80408500 | WSHR DIN6798-A6,4-FSt-A2F |
| 80412100 | WSHR DIN9021-3,2-140HV-A2F |
| 84155047 | SCR DIN965-M3x6-4.8-Z-A2F (ISO7046) |
| 91541408 | Connector Potential Equalisation |
| 91618902 | Soldering Eyelet, 6,4, 2x |
| 91920392 | Ribbon Cable IDE/AT-BUS |

| | |
|-----------------------------|--|
| 92308100 | Fastening Strap 92 X 2,4 mm |
| 92309630 | Mounting Socket |
| 92722902 | Label, 25,8 x 6,8 |
| 92723001 | Distance Pin M3 L=11 4p |
| 92916633 | Ferrite Core 7,8-8,5 mm |
| | |
| 70128701 | Operating System MS NT4.0,WS (D , OEM) |
| 70128702 | Operating System MS NT4.0,WS (E , OEM) |
| 70128703 | Operating System MS NT4.0,WS (F , OEM) |
| 70128704 | Operating System MS NT4.0,WS (IT, OEM) |
| 70128705 | Operating System MS NT4.0,WS (SP, OEM) |
| 70128706 | Operating System MS NT4.0,WS (RU, OEM) |
| 70128707 | Operating System MS NT4.0,WS (SW, OEM) |
| 70128708 | Operating System MS NT4.0,WS (JP, OEM) |
| | |
| 70124919 | PC Powersupply, ATX |
| 91541811 | PS2 Keyboard Adapter |
| | |
| 38401861 | <i>Kit Pentium II CPU-Board incl</i> |
| 70124910 | Mainboard PII SE 440 BX |
| 70124911 | Intel Pentium II 350 MHz Prozessor |
| 70124913 | DIMM SDRAM 64 MB, PC100 |
| 70124917 | Active Cooler for Pentium II Prozessor |
| | |
| 38401860 | <i>Kit Pentium II PC CardioSys incl.</i> |
| 30344552 | Monuting KitHDD |
| 70124301 | Floppy Drive, 3,5 Zoll |
| 70124915 | IO-Shield for Intel ATX-Board |
| 2000173-001 | INTFC VGA GRAFIC CARD AGP 8MB - Matrox Productiva G100 . Replaced with - Matrox Productiva G200 (same Win NT driver as for G100) |
| 70124928 | CD-ROM-Drive, IDE |
| 75130009 | Harddisk, 4.3GB |
| 2000148-001 | INTFC MULTI I/O ETC 9081 |
| 2000459-001 | CABLE ASSY FOR FLOPPY LONG |
| | |
| SCSI Component's | |
| 70124916 | SCSI Controller for MO and DAT streamer drives Replacement is 2001967-001. |

| | |
|----------------------------|---|
| 2001967-001 | SCSI Controller Adaptec AVA-2904 for MO and DAT streamer drives |
| 38401875 | Parts Kit 2/4 GB DAT Streamer |
| 70124918 | DAT Streamer, HP C1539/99A, DDS-2, SCSI, 4-8 GB |
| 38401807 | Parts Kit: MO Drive 3.5", 640 MByte |
| 91920330 | Magneto-optical Disk, 640 MByte rewritable |
| Network Component's | |
| 70118072 | Network card, PCI (3COM) |
| 38401580 | Network Parts Kit with SMX 001 (10 Base 2) |
| 38401733 | Network Parts Kit with SMX 005 (10 Base T) |
| 21610701 | Transceiver SMX 001 for BNC (10 Base 2) |
| 21613301 | Transceiver SMX 005 for Twisted Pair (10 BASE T) |
| 22329804 | Connection Cable from Ethernet Card AUI (10 Base 5) to Tranceiver SMX001/SMX005 |

Software

| | |
|------------------------------------|---|
| 25033915 | CardioSoft V4.13 |
| 25029616 | CardioSoft V4.13 DFT |
| 25034009 | CardioSoft Demoverision V4.13 |
| 25046010 | CardioSoft Client V4.13 |
| 44008370 | Installation Manual CardioSoft V4.1x |
| | |
| Software / Hardware Updates | |
| 25043220 | SW-Update from Version Vxx ----> to V4.13 |
| 25043221 | SW-Update from Version V2.5...3.04 ----> to V4.13 |
| 2000642-001 | <p>CardioSys / MicroLab Hard -and Software Upgrade to Windows NT</p> <p>Contains complete PC Box and it's also possible to order with additional options:</p> <ul style="list-style-type: none"> - Network - DAT Streamer - MO Disk Drive <p>(Upgrade is only possible with CardioSys/MicroLab that has the Floppy Disk Drive in the PC Box itself. If the FDD is near by the VGA Monitor, no upgrade available!)</p> |

MicroLab Addition (202 316 ..)

| | |
|------------|--------------------------------------|
| 93011798 | PCB IBM PC TRAM-NET INTERFACE Board |
| 22339801 | Connection Cable TRAMRAC |
| 21733201 | TRAM-NET Terminator |
| #9405-001 | Blank Module |
| 404183-096 | Service Manual Tram-Rac |
| 414993-033 | Service Manual Solar SPO2 Mod |
| 50465981 | Pull reliver for power cord Tram-Rac |
| 22339801 | Connector cable |
| 21733201 | Dongle Tram-Rac |

Cable Connections

| | |
|---|--|
| 22339001 | T2000 <-- RS422 to RS232 --> CardioSys |
| 700609-001 | T2000 <-- RS232 to RS232 --> CardioSys |
| 22336603 | EC1200 <-- RS232 to RS232 --> CardioSys |
| 22338001 | Ergoline 900 <-- RS232 to RS232 --> CardioSys |
| 22336203 | EC560/EC561 <-- RS232 to RS232 --> CardioSys |
| 22336801 | TM400/TM310 <-- RS232 to RS232 --> CardioSys |
| 22333003 | M40/M700 <-- RS232 to RS232 --> CardioSys |
| 22337201 | EK53/56/512 <-- RS232 to RS232 --> CardioSys |
| 22336203 | MAC 1200 <-- RS232 to RS232 --> CardioSys |
| 22336203 | CardioSmart <-- RS232 to RS232 --> CardioSys |
| 22336203 | Bosotron 2 <-- RS232 to RS232 --> CardioSys |
| 22338101 | Suntech 4240 <-- RS232 to RS232 --> CardioSys |
| 30344492 | Analog out (one end is without any connector) |
| 22342601 | To Infrared Modul 93011772 (for Communication with Microsmart) |
| 70121736 | Tonoport 4 <-- RS232 to RS232 (25pol.)--> CardioSys |
| 70121737 | Tonoport 4 <-- RS232 to RS232 (9pol.)--> CardioSys |
| | |
| Patient Cable Ferrite Kit for CardioSys / MicroLab | |
| 2000456-001 | ASSY FERRITE FOR CSYS |

Electrical Component's

| | |
|----------|-----------------------------------|
| 91906200 | Power Cord (German Standard), 3 m |
| 91432609 | Power Switch with lamp |
| 91541408 | Plug for Ground |
| 91541791 | Schuko-Multipoint Connector |

| | |
|----------|---|
| 91920155 | Mains Extension with 6 Outputs |
| 91208440 | Fuse, T 3,15 A |
| 90768971 | Transformer isolating 230V for medical use equipment, IEC 601 |
| 90768972 | Transformer isolating 115V for medical use equipment, IEC 601 |
| 91541308 | DISTRIBUTION CONNECTOR |
| 38327300 | WIRE SET |
| 38401597 | Power Input Set Cardiosys / MicroLab |

Mechanical Components of CardioSys

| | |
|----------|---|
| 43252248 | Corpus |
| 50465749 | Sideplate left/right (blue-green) |
| 50465911 | Sideplate left/right (gray) |
| 50465759 | Cover Plate above left hand side of the Railhandle |
| 50465741 | Cover Plate above right hand side of the Railhandle |
| 50465742 | Cover Plate under Railhandle |
| 50465746 | Supporting Bracket |
| 50465747 | Table Plate |
| 43252252 | Flap |
| 50465750 | Railhandle |
| 43252251 | Monitor Holder |
| 43252351 | Spacing Plate |
| 50465743 | Plate for Monitor Holder |
| 43252249 | Lower Drawer |
| 43252250 | Upper Drawer |
| 43252283 | Frontbezel for Drives |
| 50465740 | Frontpanel |
| 92723015 | Cramp for Frontbezel |
| 43252254 | Locking Cap |
| 92805665 | Full length coupound action slide |
| 92805666 | Coupoundaction coupling right |
| 92805667 | Coupoundaction coupling left |
| 92805664 | Ball bearing slide |
| 42819518 | Insertplate for Computer |
| 92401600 | RUBBER-METAL CONNECTION |
| 92309630 | MOUNTING BASE |
| 92308100 | FASTENING STRAP |
| 91618913 | CLAMP |
| 50465833 | Frame for Chassis |
| 75130015 | Wheel without brake antistatic |
| 75130016 | Wheel with brake antistatic |
| 75130017 | Cagenut M5 |

| | |
|---|--------------------------------|
| 75130018 | Thumbscrew M5 |
| 50465745 | Mounting Angle for Monitor |
| 75130019 | Hinge |
| 75130020 | Lock |
| 75130021 | Clips |
| | |
| Different parts of a MicroLab System | |
| 30344620 | Bracket for Function Keyboard |
| 50465953 | Fixing Plate for Tram-Rac Tray |
| 50465954 | Fixing Plate for Tram-Rac |
| 91618976 | Cable Clamp |
| | |
| Additional Mechanical Component's | |
| 38401831 | Recorder plate for AR200 |
| 50465949 | Railhandle for MicroLab |
| 43252469 | Table Plate for MicroLab |
| | |
| Mounting Kit for 15" Monitor | |
| 2000457-001 | MTG KIT 15" SCOPE |

Monitors

| | |
|----------|---|
| 70124505 | Monitor 15" (Type Mitsubishi SD 5904 C) |
| 70124512 | Monitor 17" (Type Mitsubishi TFV 8708) |

Printers

| | |
|----------|--------------------------------|
| 70124279 | Laser-Printer EPSON EPL-5700 |
| 70127601 | Laser-Printer HP 6 P (German) |
| 70127602 | Laser-Printer HP 6 P (English) |
| 70127603 | Laser-Printer HP 6 P (French) |

13 Appendix

Data Sheets and User's Manuals of PC standard components

Multi I/O Interface Card Handbook

User's Manual

ETC - 9081

DESCRIPTION:

The ETC-9081 PC-card is equipped with 2 serial RS-232 ports and 2 parallel Centronics ports. Any parallel or serial standard address, as well as any free 16-Bit interrupt can be assigned to each port.

In addition to the 4 standard Addresses COM1-COM4, it is also possible to select one of the 4 alternative addresses: COM5-COM8. In this way it is possible to operate more than the 4 standard COM-ports available. In order to use the alternative COM addresses (COM5-COM8), the addresses must be set in the software application.

Optionally, the card can be equipped with 1 or 2 serial 550 FIFO ports (16C550). This is especially recommended for high speed serial transfers. It increases the data transfer rate, prevents loss of data and reduces the CPU's workload.

The extended 16-Bit address decoding makes it simple to install COM4 even in systems with graphic cards which work in 8514 standard mode (e.g. S3 chip).

The compact size (short 16-Bit card) and the 35cm-long connecting cable make installation simple even in a large tower casing.

The ETC-9081 is compatible with all ISA and EISA systems with 286, 386, 486 and Pentium processors. The Bus clock rate can be as high as 16 Mhz which increases system performance (8MHz is standard).

CONFIGURATION:

The ETC-9081 is equipped with 2 jumper blocks for every port; one to select the address, and one for the interrupt.

Use the jumpers to select the required function. If the jumper is unplugged, the port or interrupt is deactivated.

If you wish to use the ETC-9081 in addition to interfaces already present, please determine the port addresses already in use by observing the BIOS report generated when you boot your system or with the help of a suitable diagnostic program, e.g. MSD. Now select the free port addresses on the ETC-9081.

Standard setting ex-factory:

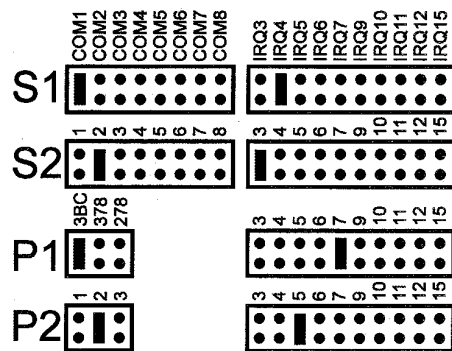


Figure 1: Jumperblock

INSTALLATION:

The D-SUB plugs and sockets on the slot connector can be mounted in an unused knock-out panel found on most cases, or alternatively, using the mounting brackets, into any free expansion slot.

Now connect the ribbon slot connector to the corresponding socket on the board. Make sure that the colour-marked wire is connected to the side of the board marked "1". The ETC-9081 can then be inserted into any free 16-Bit expansion slot.

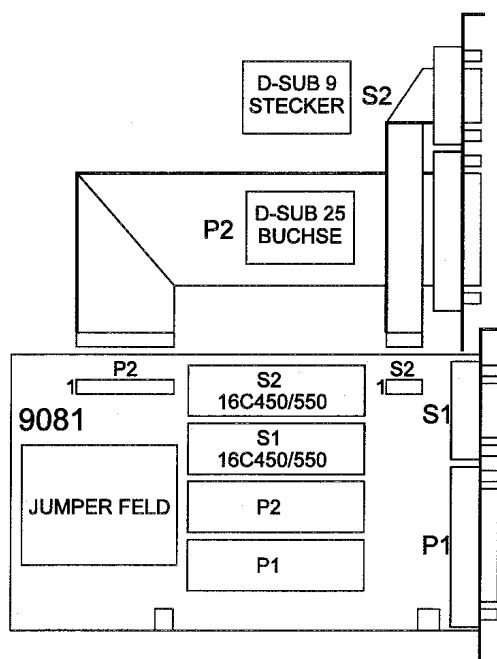


Figure 2: Connecting the ribbon slot connectors

NOTES:

Although the system architecture of compatible computers permits two cards to share one interrupt, they cannot both operate at the same time. This frequently causes problems with programs that use several interrupt controlled devices, e.g. mouse and modem. Such clashes can be avoided by using the extended (16-Bit) interrupt areas. In this case the interrupt selected must be supported by the software in use.

Please note that most diagnostic programs currently available do not recognise the extended interrupt area.

Optionally, the ETC-9081 can be supplied with one or two 16C550 chips. The card is then equipped with 1 to 2 serial FIFO channels.

In this case, the chip caches 16 Bytes on chip which reduces the CPU's workload. Most modern software supports this mode.

Because of the extended 16-Bit address decoding, the card enables simple installation of COM4 even on systems which are equipped with 8514 compatible graphic cards (e.g. S3 chip).

Other I/O cards often cause problems when COM4 is activated which, in the worst cases, can lead to a system crash.

PROGRAMMING NOTES:

The ETC-9081 can be set to all standard parallel and serial port addresses. Therefore, it can be used in any compatible system without software drivers. If the extended 8-Bit or 16-Bit interrupt area is used in place of the standard interrupts, or if a non-standard COM address (COM5-COM8) is used, this must be supported by the software in use. Many programs - in particular - modern operating systems - allow you to configure the interrupts and addresses as required.

TECHNICAL SPECIFICATIONS:

Serial ports:

2 x RS-232 Standard with 2 x D-SUB-9 plug

COM 1-4 (03F8h, 02F8h, 03E8h, 02E8h)

COM 5-8 (03E0h, 02F0h, 02E0h, 0260h)

Interrupt selectable: 3,4,5,6,7,9,10,11,12 or 15

16-Bit address decoding (8514 compatible)

Maximum Baud rate: 115 200 Baud

All ports and interrupts can be disabled

Optional 1 to 2 serial FIFOs (550s)

Parallel ports:

2 x Centronics Standard Ports with 2 x D-SUB-25 sockets

LPT1-3 (03BCh, 0378h, 0278h)

Interrupt selectable: 3,4,5,6,7,9,10,11,12 or 15

All ports and interrupts can be disabled

Physical characteristics:

Short 16-Bit card, 157mm x 97mm

Compatible with ISA and EISA systems
Maximal 16 MHz Bus clock, at any system clock
35cm-long connecting cable with D-SUB connector
Gold plated plugs
Operating temperature 0° - 55° Celsius
+5VDC 400mA, +12VDC/-12VDC 125mA

System requirements:
286, 386, 486 or Pentium

Compatibility:
DOS, WINDOWS, WINDOWS/NT, WFW, WINDOWS/95, OS/2, UNIX and Novell

Warranty:
3 years

Contents:
1 ETC-9081 card
2 Connecting cables: 1 x D-SUB-25, 1 x D-SUB-9
1 English User's manual

Ordering code:
Standard card: ETC-9081-00
1 serial FIFO port: ETC-9081-01
2 serial FIFO ports: ETC-9081-02
FIFO chip 16C550: ETC-055000-30
FIFO chip 16C650: ETC-065000-30

EMC-Requirements:
This product conforms to the EMC-Requirements as laid down by the Council Directive 89/336/EEC.
Please use shielded connecting cables.

Manufacturer:
Wleklinski Messtechnik
D-63225 Langen, Germany
All references to computer systems and components as well as software and peripheral devices use trademarks licensed to the corresponding manufacturer.

Appendix

Wiring Diagrams

Network-Cards:

SE440BX Motherboard – Product Guide

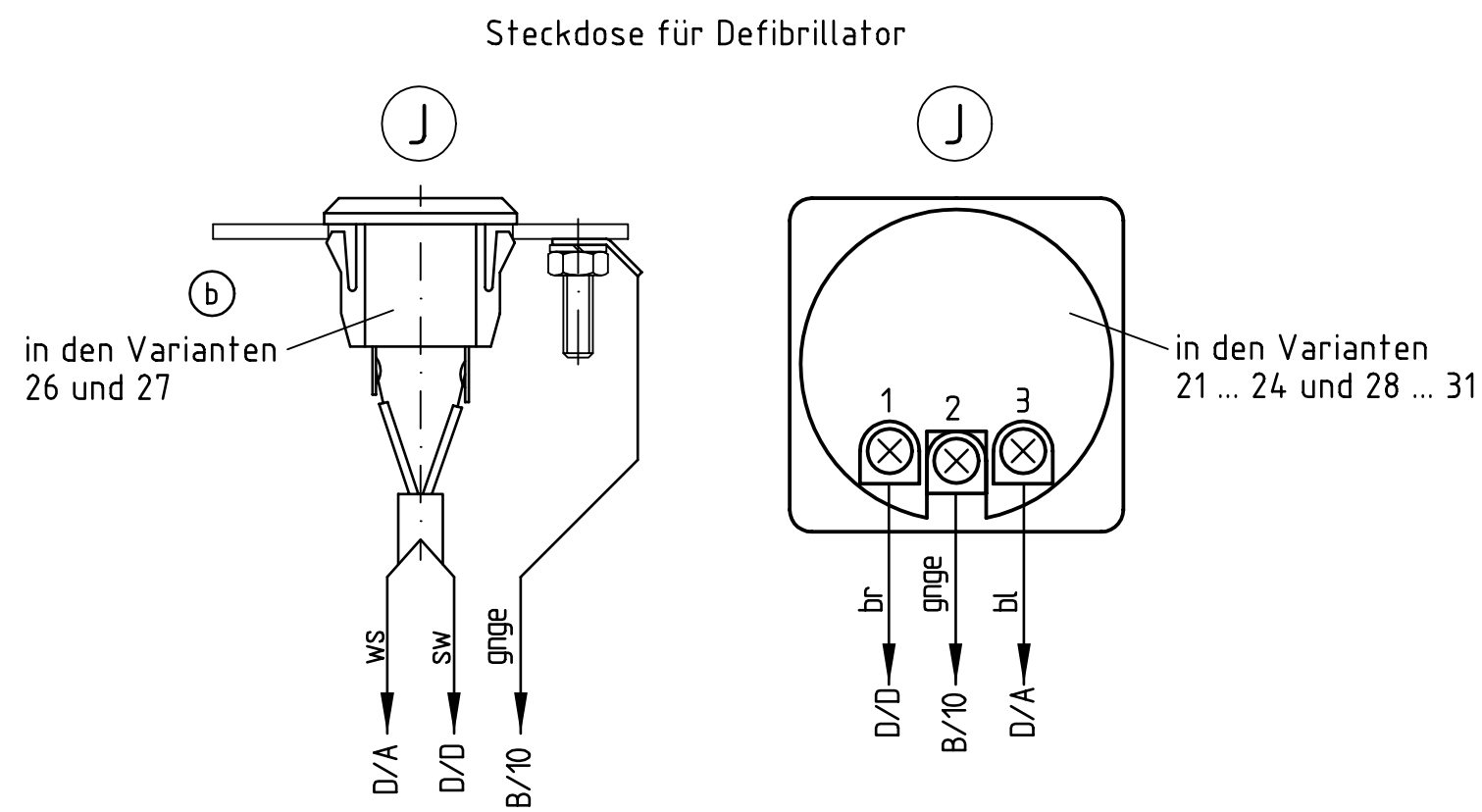
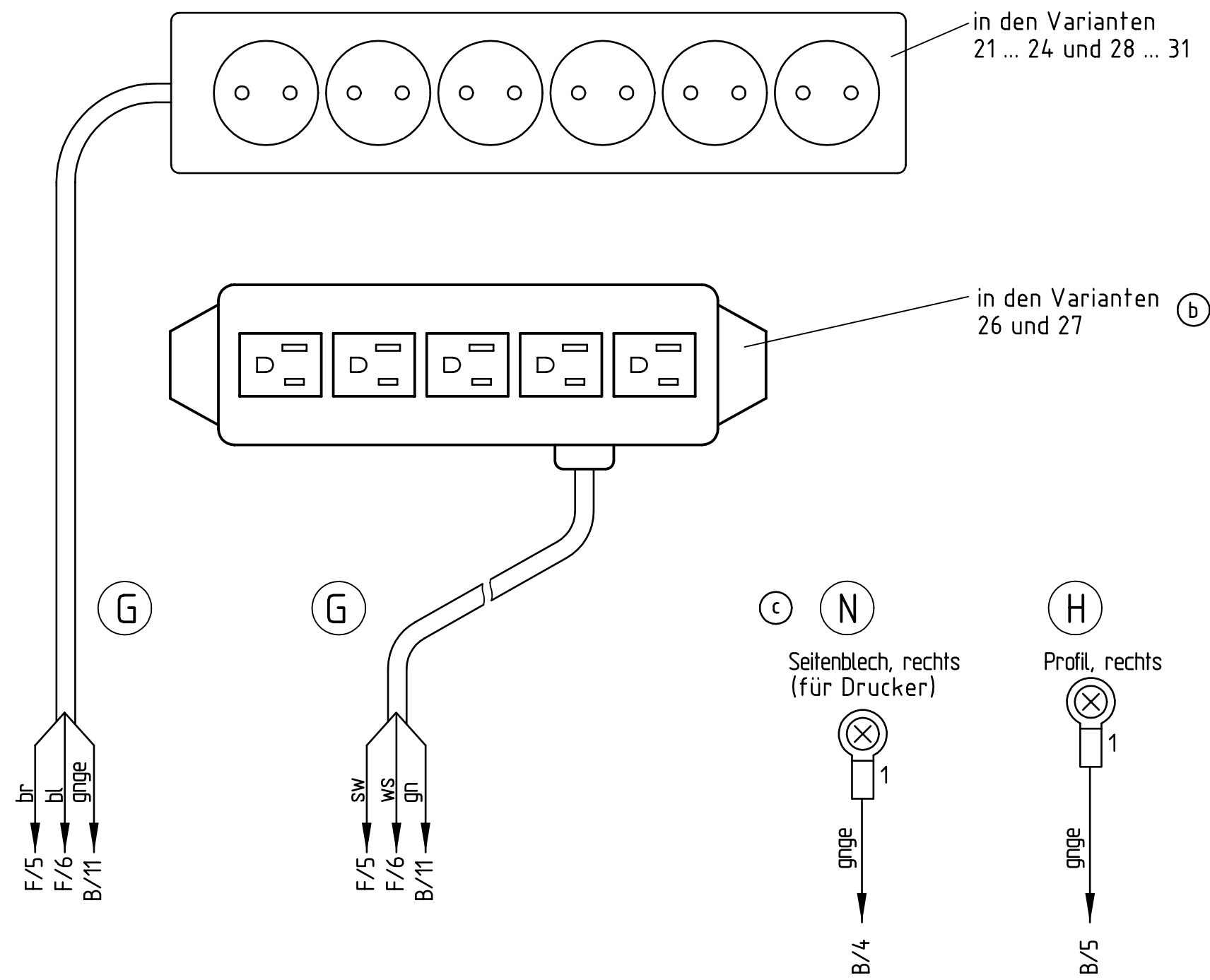
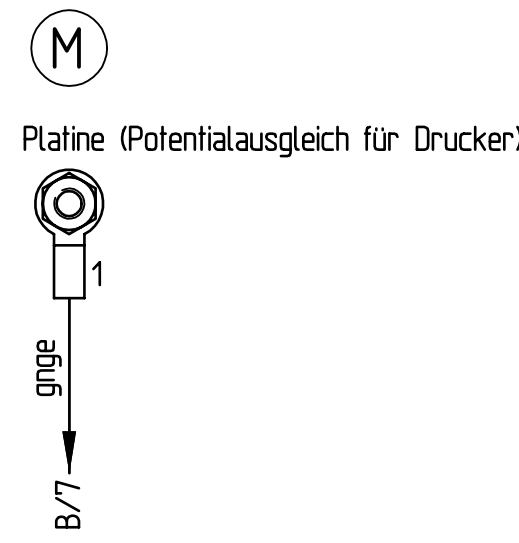
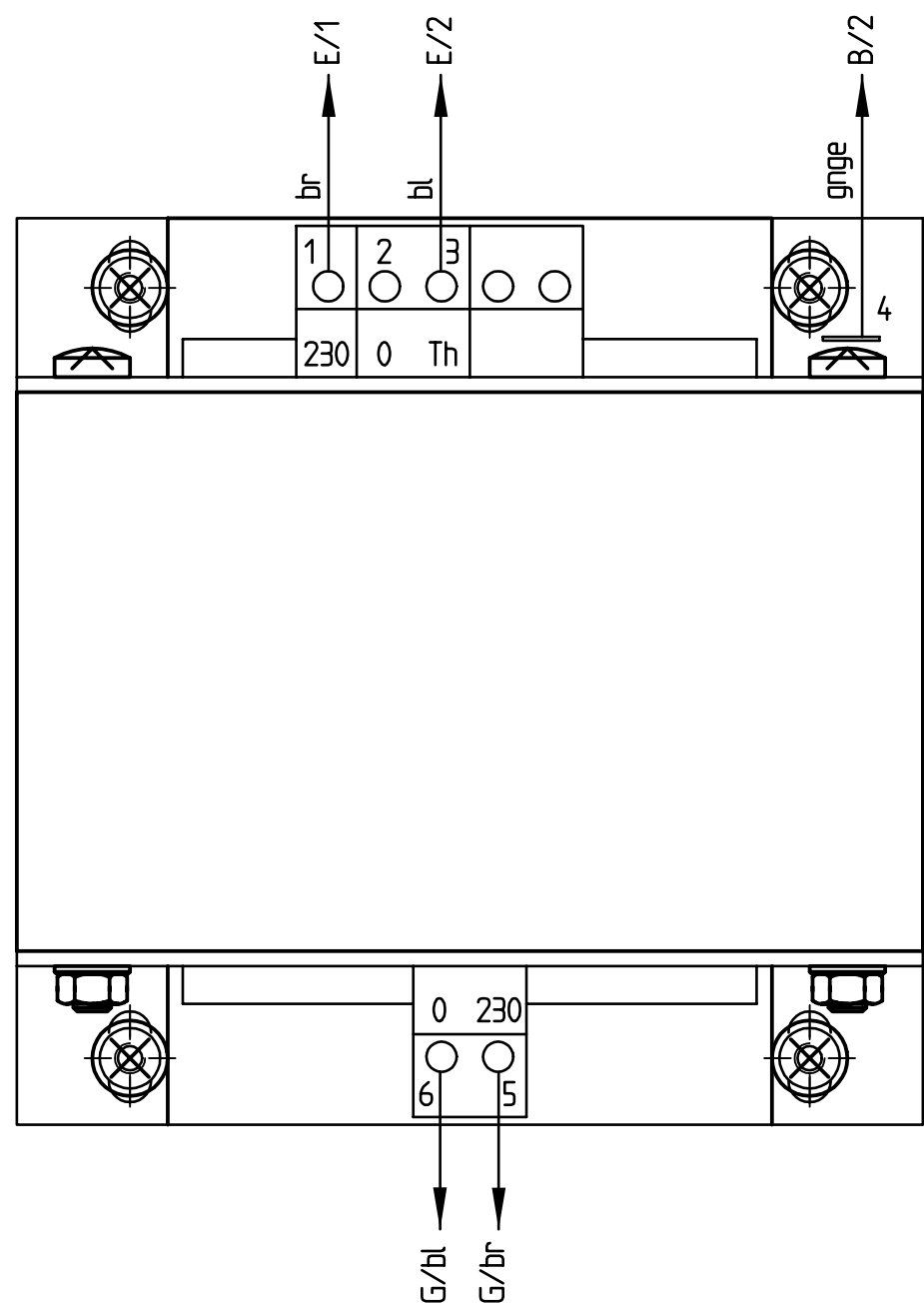
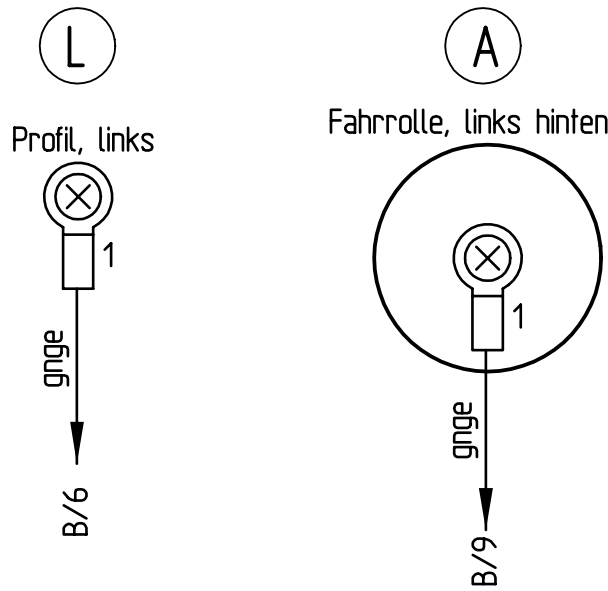
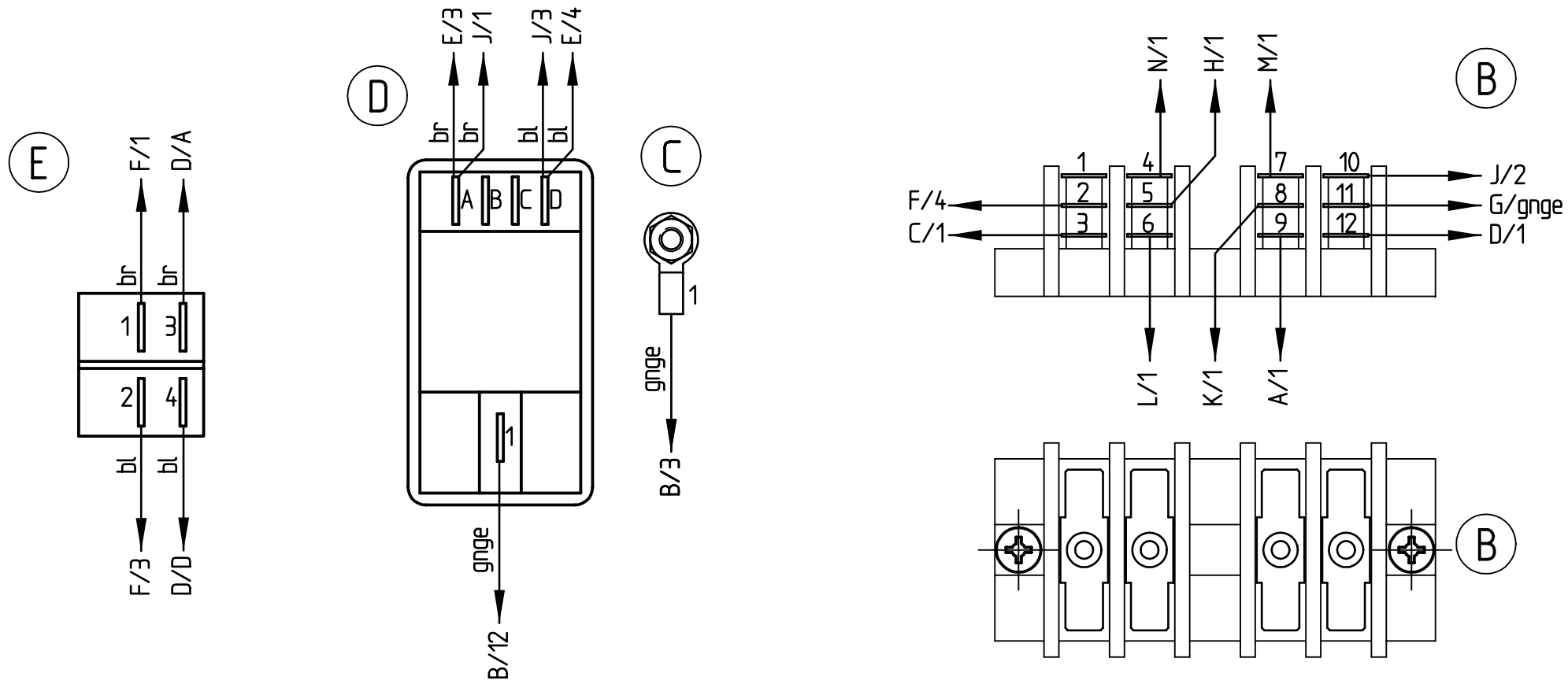
Matrox Graphics Card – Installation Guide

Excerpt of EtherLink XL PCI 10 Mbps Network Interface Cards – User Guide

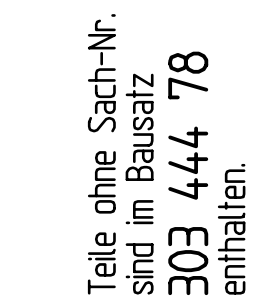
AHA-2910 PCI-to-Fast SCSI Host Adapter – Installation Guide

CORINA – Servicing Instructions

Schutzvermerk nach DIN 34 beachten



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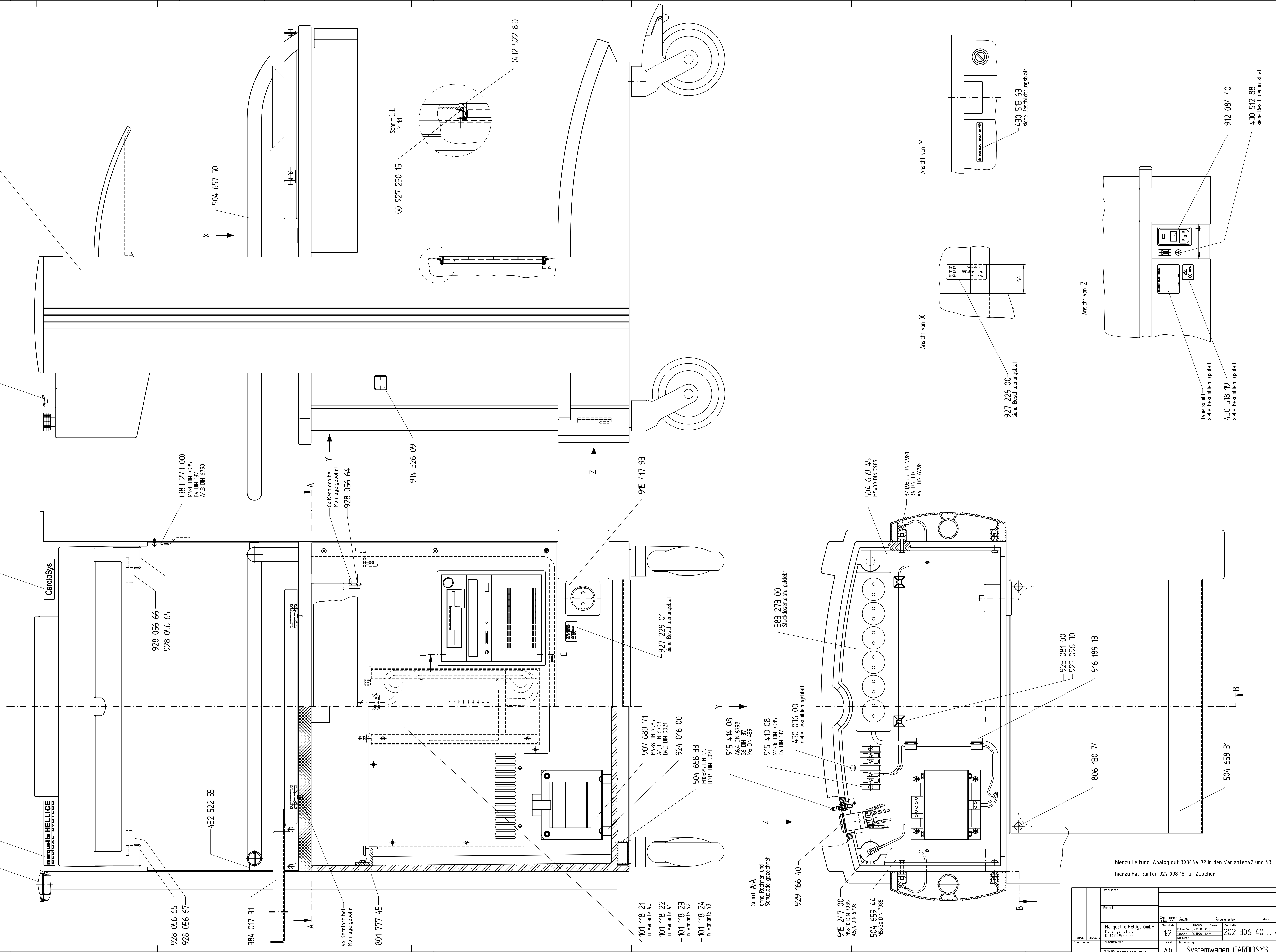
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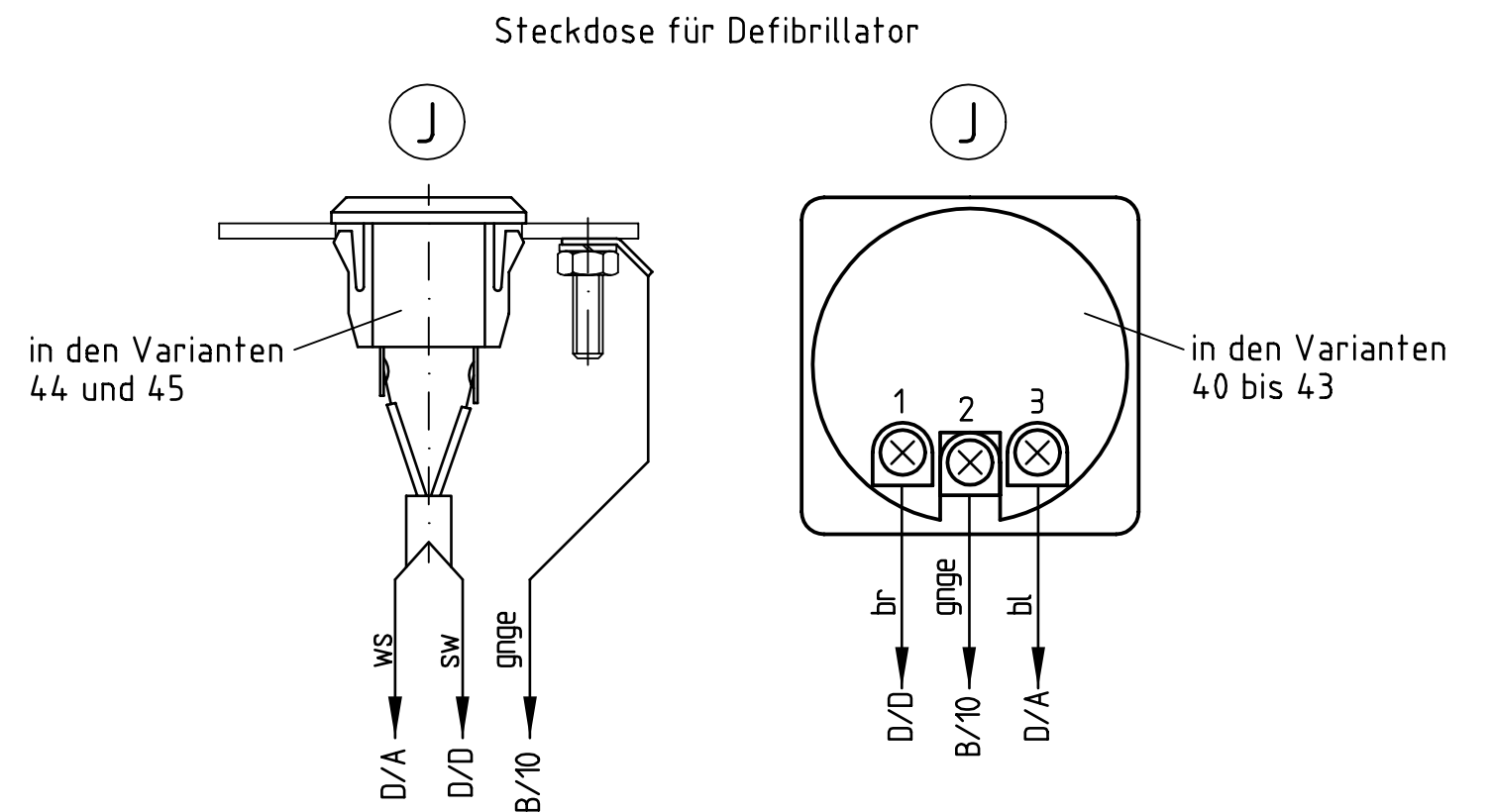


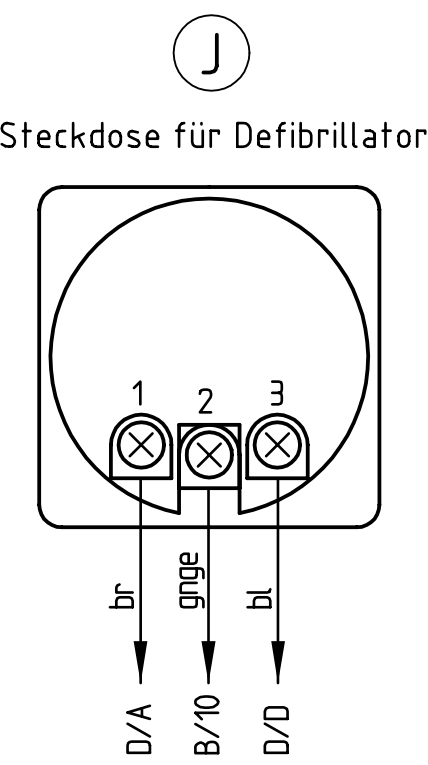
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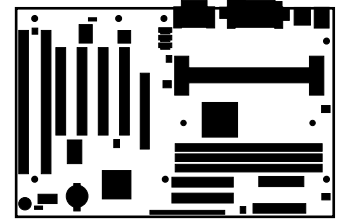
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SE440BX

Motherboard

Product Guide



Order Number: 697967-001

Revision History

| Revision | Revision History | Date |
|----------|---|----------------|
| -001 | First release of the SE440BX Motherboard Product Guide. | February, 1998 |

If an FCC declaration of conformity marking is present on the board, the following statement applies:

FCC Declaration of Conformity

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For questions related to the EMC performance of this product, contact:

Intel Corporation
5200 N.E. Elam Young Parkway
Hillsboro, OR 97124
1-800-628-8686

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to an outlet on a circuit other than the one to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Canadian Department of Communications Compliance Statement:

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe B prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

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An Intel product, when used in accordance with its associated documentation, is "Year 2000 Capable" when, upon installation, it accurately stores, displays, processes, provides, and/or receives date data from, into, and between the twentieth and twenty-first centuries, including leap year calculations, provided that all other technology used in combination with said product properly exchanges date data with it.

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†† Wake on LAN is a trademark of IBM Corporation.

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1 Motherboard Features

This chapter gives an overview of the SE440BX motherboard, including:

- Features
- Components
- Back panel I/O connectors

The remaining chapters explain how to:

- Add or upgrade components like processors or memory
- Use the BIOS Setup program to modify the motherboard's configuration
- Upgrade the BIOS

Features Summary

- ATX form factor of 12 x 7.75 inches with seven mounting screw holes
- Support for a single Pentium® II processor
 - 66 MHz and 100 MHz host bus speeds
 - Slot 1 connector
 - Integrated 512 KB second-level cache
- Three DIMM sockets
 - Supports up to 384 MB of synchronous DRAM (SDRAM) memory
- Intel 82440BX AGPset
 - PCI/A.G.P. controller (PAC)
 - PCI ISA IDE Xcelerator (PIIX4E)
- I/O controller
- Two USB ports
- Intel/Phoenix Basic Input/Output System (BIOS)
- Single-jumper configuration
- Onboard Accelerated Graphics Port (A.G.P.) connector

Software drivers and utilities are available from Intel.

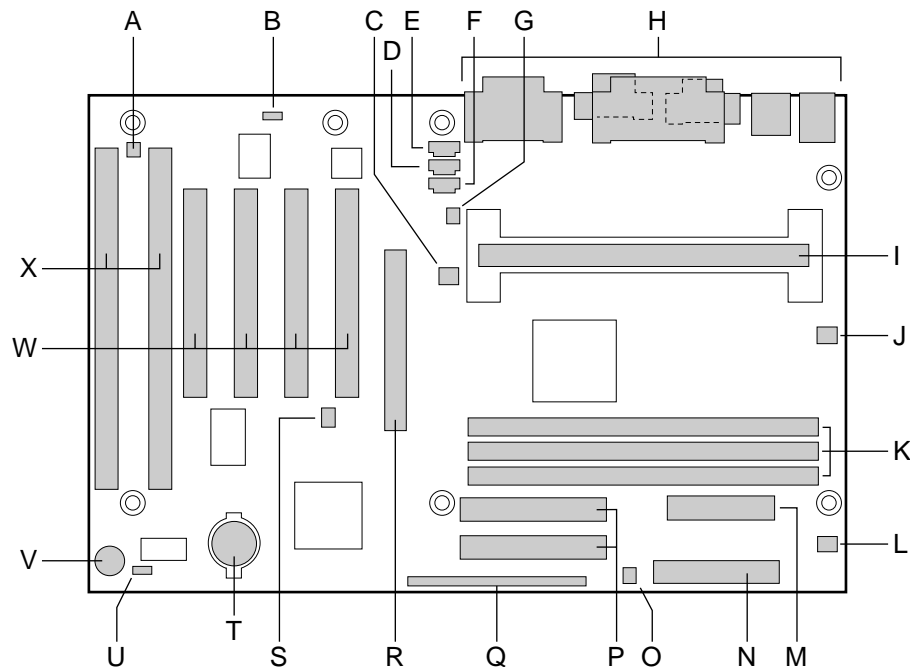
⇒ NOTE

For information about Intel motherboards, including technical product specifications, BIOS upgrades, and device drivers, see “Products” at the Intel World Wide Web site:

<http://developer.intel.com/>

Components

Figure 1 shows the major components on the motherboard.



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| | | | |
|---|---|---|--|
| A | Wake on Ring connector | M | Power supply connector |
| B | Wake on LAN ⁺⁺ technology connector (optional) | N | Diskette drive connector |
| C | Fan 3 connector | O | SCSI LED connector |
| D | Telephony connector (optional) | P | IDE connectors |
| E | CD-ROM audio connector (optional) | Q | Front panel connectors |
| F | Auxiliary Line In connector (optional) | R | Accelerated Graphics Port (A.G.P.) connector |
| G | Chassis intrusion connector (optional) | S | PC/PCI connector |
| H | Back panel connectors | T | Battery |
| I | Slot 1 connector | U | Configuration jumper block |
| J | Fan 2 connector | V | Speaker (optional) |
| K | DIMM sockets | W | PCI slots |
| L | Fan 1 connector | X | ISA slots |

Figure 1. Motherboard Components

➡ NOTE

Components labeled optional do not come on all SE440BX motherboards.

Back Panel I/O Connectors

Figure 2 shows the back panel I/O connectors on the motherboard.

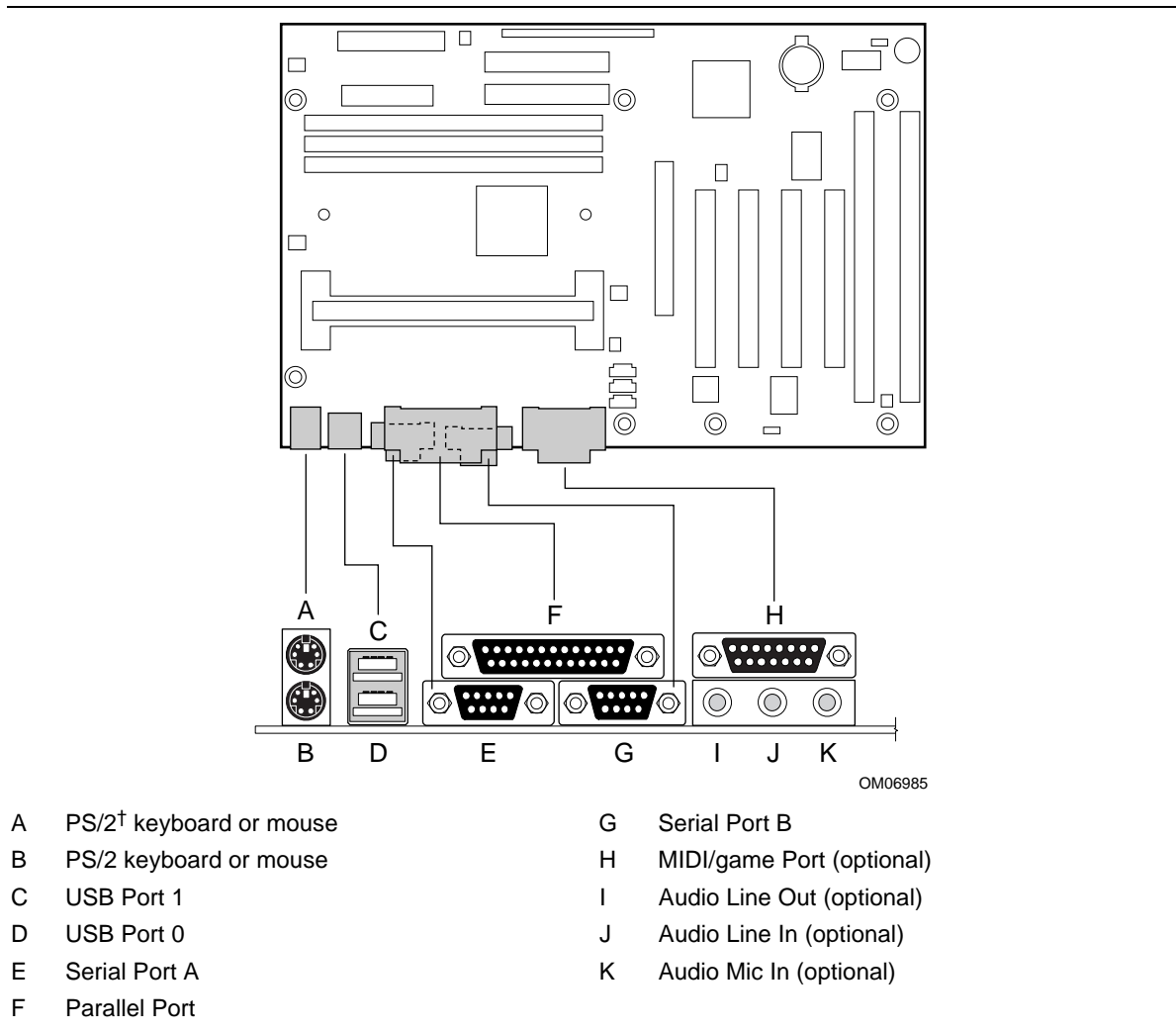


Figure 2. Back Panel I/O Connectors

Microprocessor

The motherboard supports a single Pentium II processor operating at any of the Pentium II processor speeds, voltages, and bus frequencies. Processors are not included with the SE440BX motherboard and must be purchased separately.

The processor is packaged in a Single Edge Contact (S.E.C.) cartridge. The cartridge includes the processor core, second-level cache subsystem, thermal plate, and back cover.

The processor connects to the motherboard through the Slot 1 connector, a 242-pin edge connector. When mounted in Slot 1, the processor is secured by a retention mechanism attached to the motherboard. A passive heatsink is stabilized by the heatsink support.

Microprocessor Upgrades

The motherboard can be upgraded with Pentium II processors that run at higher speeds. To upgrade the processor, use the BIOS configuration mode to change the processor speed, see Chapter 2.

Main Memory

The motherboard has three sockets for installing dual inline memory modules (DIMMs). Minimum memory size is 8 MB; maximum memory size is 384 MB. To install memory, see Chapter 2.

Second Level Cache Memory

The second-level cache is located in the S.E.C. cartridge. The cache includes synchronous pipelined burst static RAM (PBSRAM) and tag RAM. There are four PBSRAM components totaling 512 KB in size. All supported onboard memory is cacheable.

PCI Enhanced IDE Interface

The PCI enhanced IDE interface handles the exchange of information between the processor and peripheral devices like hard disks and add-in boards inside the computer. The interface supports:

- Up to four IDE devices such as hard drives
- ATAPI devices
- PIO mode 3 and PIO mode 4 devices
- Up to four PCI cards or up to two ISA cards and three PCI cards
- Logical block addressing (LBA) of hard drives larger than 528 MB and extended cylinder head sector (ECHS) translation modes
- Support for laser servo (LS-120) drives

Input/Output (I/O) Controller

The I/O controller handles the exchange of information between the processor and external devices like the mouse and keyboard or a printer that are connected to the computer. The controller features the following:

- Integrated keyboard and mouse controller
- Industry standard diskette drive controller
- One multimode bi-directional parallel port
 - Standard mode: Centronics-compatible operation
 - High speed mode: support for enhanced capabilities port (ECP) and enhanced parallel port (EPP)
- Two serial ports
- Flexible IRQ and DMA mapping for Windows[†] 95

Real-Time Clock

The motherboard has a time-of-day clock and 100-year calendar that will rollover to 2000 at the turn of the century. A battery on the motherboard keeps the clock current when the computer is turned off.

⇒ NOTE

The recommended method of accessing the date in systems with Intel motherboards is indirectly from the Real-Time Clock (RTC) via the BIOS. The BIOS on Intel motherboards and baseboards contains a century checking and maintenance feature that checks the least two significant digits of the year stored in the RTC during each BIOS request (INT 1Ah) to read the date and, if less than 80 (i.e., 1980 is the first year supported by the PC), updates the century byte to 20. This feature enables operating systems and applications using the BIOS date/time services to reliably manipulate the year as a four-digit value.

For more information on proper date access in systems with Intel motherboards please see <http://support.intel.com/support/year2000/paper.htm>

Universal Serial Bus (USB) Support

The motherboard has two USB ports. You can connect two USB peripheral devices directly to the computer without an external hub. To attach more than two devices, connect an external hub to either of the built-in ports. The motherboard supports the standard universal host controller interface (UHCI) and takes advantage of standard software drivers written to be compatible with UHCI. The USB features the following:

- Support for hot swapping Plug and Play devices
- Support for self-identifying peripherals

- Support for up to 127 physical devices
- Guaranteed bandwidth and low latencies appropriate for telephony, audio, and other applications

⇒ NOTE

Computer systems that have an unshielded cable attached to a USB port may not meet FCC Class B requirements, even if no device or a low-speed USB device is attached to the cable. Use a shielded cable that meets the requirements for a high-speed USB device.

A.G.P.

The A.G.P. is a high-performance interconnect for graphics-intensive applications, such as 3D graphics. A.G.P. is independent of the PCI bus and is intended for exclusive use with graphical display devices. A.G.P. provides these features:

- Pipelined memory read and write operations that hide memory access latency
- Demultiplexing of address and data on the bus for near 100 percent bus efficiency
- AC timing for 133 MHz data transfer rates, allowing real data throughput in excess of 500 MB/sec

BIOS

The motherboard's system BIOS is contained in a flash memory device on the motherboard. The BIOS provides the power-on self test (POST), the BIOS Setup program, and the PCI and IDE auto-configuration utilities.

The BIOS is always shadowed. Shadowing allows BIOS routines to be executed from fast 64-bit onboard DRAM instead of from the slower 8-bit flash memory device.

BIOS Upgrades

Because the BIOS is stored in a flash memory device, you can upgrade the BIOS by using a software utility on a diskette or hard disk, or over a network. For information on upgrading the BIOS, see Chapter 4.

PCI Auto Configuration

If you install a PCI add-in board in your computer, the PCI auto-configuration utility in the BIOS automatically detects and configures the resources (IRQs, DMA channels, and I/O space) for that add-in board. You do not need to run the BIOS Setup program after you install a PCI add-in board.

However, PCI add-in boards use the same IRQ resources as ISA add-in boards. If you install both a PCI and an ISA add-in board, you must specify the IRQ used by the ISA card. The PCI auto configuration program complies with version 2.1 of the PCI BIOS specification.

IDE Auto Configuration

If you install an IDE device (e.g., a hard drive) in your computer, the IDE auto-configuration utility in the BIOS automatically detects and configures the device for your computer. You do not need to run the BIOS Setup program after installing an IDE device.

ISA Plug and Play Capability

The motherboard provides auto configuration of Plug and Play ISA cards and resource management for legacy (non-Plug and Play) ISA cards when used with the ISA Configuration Utility (ICU) or a Plug and Play compatible operating system like Windows 95. To obtain the ICU, contact your computer supplier.

Security Passwords

The BIOS includes security features that restrict whether the BIOS Setup program can be accessed and who can boot the computer. A supervisor password and a user password can be set for the Setup program and for booting the computer, with the following restrictions:

- The supervisor password gives unrestricted access to view and change all the Setup options in the Setup program. This is supervisor mode.
- The user password gives restricted access to view and change Setup options in the Setup program. This is user mode.
- If only the supervisor password is set, pressing the <Enter> key at the password prompt of the Setup program gives the user restricted access to Setup.
- If both the supervisor and user passwords are set, you must enter either the supervisor password or the user password to access Setup.
- Setting a user password restricts who can boot the computer. The password prompt is displayed before the computer is booted. If only the supervisor password is set, the computer boots without asking for a password. If both passwords are set, you can enter either password to boot the computer.

Expansion Slots

The motherboard has five expansion slots for installing add-in boards, like network cards, that expand the capabilities of your computer. The expansion slots are as follows:

- One ISA slot
- Three PCI slots
- One shared PCI/ISA slot

Power Management

The motherboard supports two types of power management — Advanced Power Management (APM) and Advanced Configuration and Power Interface (ACPI).

Advanced Power Management (APM)

APM's energy saving standby mode can be initiated in the following ways:

- Specify a time-out period in Setup
- Press the suspend/resume switch connected to the front panel sleep connector
- Use an operating system option, such as the Suspend menu item in Windows 95

In standby mode, the motherboard can reduce power consumption by spinning down hard drives, and reducing power to or turning off VESA[†] DPMS-compliant monitors. Power-management mode can be enabled or disabled in Setup (see Chapter 3).

While in standby mode, the system retains the ability to respond to external interrupts and service requests, such as incoming faxes or network messages. Any keyboard or mouse activity brings the system out of standby mode and immediately restores power to the monitor.

The BIOS enables APM by default; but the operating system must support an APM driver for the power-management features to work. For example, Windows 95 supports the power-management features upon detecting that APM is enabled in the BIOS.

Advanced Configuration and Power Interface (ACPI)

ACPI gives the operating system direct control over the power management and Plug and Play functions of a computer. ACPI requires an ACPI-aware operating system. ACPI features include:

- Plug and Play (including bus and device enumeration) and APM functionality normally contained in the BIOS
- Power management control of individual devices, add-in boards (some add-in boards may require an ACPI-aware driver), video monitor, and hard disk drives
- Methods for achieving less than 30-watt system operation in the Power On Suspend sleeping state, and less than 5-watt system operation in the Suspend to Disk sleeping state
- A Soft-off feature that enables the operating system to power off the computer
- Support for multiple wake up events
- Support for a front panel power and sleep mode switch

Battery

A battery on the motherboard keeps the clock and the values in CMOS RAM current when your computer is turned off. To replace the battery, see Chapter 2.

Wake on Ring

Wake on Ring enables the computer to wake from sleep or soft-off mode when a call is received on a telephony device, such as a modem, configured for operation on COM1. The first incoming call powers up the computer. A second call must be made to access the computer. To access this feature use the Wake on Ring connector. See Chapter 5 for the location and pinouts of the Wake on Ring connector.

Wake on LAN Technology (Optional)

Wake on LAN technology enables remote wakeup of the computer through a network. Wake on LAN technology requires a PCI add-in network interface card (NIC) with remote wakeup capabilities. The remote wakeup connector on the NIC must be connected to the onboard Wake on LAN technology connector. The NIC monitors network traffic at the MII interface; upon detecting a Magic Packet[†], the NIC asserts a wakeup signal that powers up the computer. To access this feature use the Wake on LAN technology connector. See Chapter 5 for the location and pinouts of the Wake on LAN technology connector.



CAUTION

For Wake on LAN, the 5-V standby line for the power supply must be capable of delivering +5 V \pm 5 % at 720 mA. Failure to provide adequate standby current when implementing Wake on LAN, can damage the power supply.

Hardware Monitor (Optional)

The optional hardware monitor subsystem provides low-cost instrumentation capabilities. The features of the hardware monitor subsystem include:

- Support for an optional chassis intrusion connector
- An integrated ambient temperature sensor
- Fan speed sensors that monitor the fan 1 and fan 2 connectors (see Figure 15 for the location of these connectors on the motherboard)
- Power supply voltage monitoring to detect levels above or below acceptable values

When suggested ratings for temperature, fan speed, or voltage are exceeded, an interrupt is activated. The hardware monitor component connects to the system management (SM) bus.

Audio Subsystem (Optional)

The optional audio subsystem consists of the following:

- Crystal Semiconductor CS4236B audio codec
- Crystal Semiconductor CS4611 PCI audio accelerator
- Back panel and onboard audio connectors

Crystal Semiconductor CS4236B Audio Codec

The CS4236B audio codec's features include:

- Compatibility with Sound Blaster[†], Sound Blaster Pro[†], and Windows Sound System
- MPU-401 compatible MIDI and joystick interfaces
- Advanced MPC3-compliant input and output mixer

Crystal Semiconductor CS4611 PCI Audio Accelerator

The CS4611's PCI bus interface enables burst mode transfers of audio data between the system bus and the device's internal DMA engine and stream processor. Other features include:

- A RAM-based Digital Signal Processor optimized for digital audio processing
- A bus mastering PCI bus interface that complies with *PCI Local Bus Specification, Revision 2.1*
- Acceleration of DirectSound[†], DirectSound3D[†], DirectInput[†], and ActiveMovie[†] APIs
- General MIDI Wavetable Synthesis with Reverb and Chorus

Audio Connectors

The audio connectors include the following:

- Back panel connectors: stereo line-level output (Line Out), stereo line-level input (Line In), and Mic In
- CD audio header (black)
- Telephony (green)
- Stereo Line In (natural/white)

See Chapter 5 for the location and pinouts of the audio connectors.

Speaker (Optional)

A piezoelectric speaker is mounted on the motherboard. The speaker provides audible error code (beep code) information during the POST.

The motherboard also has a front panel connector for an offboard speaker.

2 Installing and Replacing Motherboard Components

This chapter describes the following:

- How to install and remove the motherboard
- How to install a processor
- How to prepare the motherboard for a boxed Pentium II processor
- How to install and remove memory
- How to replace the battery
- How to use the configuration jumper to set processor speed and clear passwords

Before You Begin



CAUTION

Before you install this motherboard in a chassis, see Appendix B for regulatory requirements and precautions.

- Always follow the steps in each procedure in the correct order.
- Set up a log to record information about your computer, such as model, serial numbers, installed options, and configuration information.
- Use an antistatic wrist strap and a conductive foam pad when working on the motherboard.



WARNINGS

The procedures in this chapter assume familiarity with the general terminology associated with personal computers and with the safety practices and regulatory compliance required for using and modifying electronic equipment.

Disconnect the computer from its power source and from any telecommunications links, networks, or modems before performing any of the procedures described in this chapter. Failure to disconnect power, telecommunications links, networks, or modems before you open the computer or perform any procedures can result in personal injury or equipment damage. Some circuitry on the motherboard can continue to operate even though the front panel power button is off.



CAUTION

Electrostatic discharge (ESD) can damage components. Perform the procedures described in this chapter only at an ESD workstation. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the computer chassis.

How to Install and Remove the Motherboard

Refer to your chassis manual for instructions on installing and removing the motherboard. The motherboard is secured to the chassis by seven screws. Figure 3 shows the locations of the mounting screw holes.

⇒ NOTES

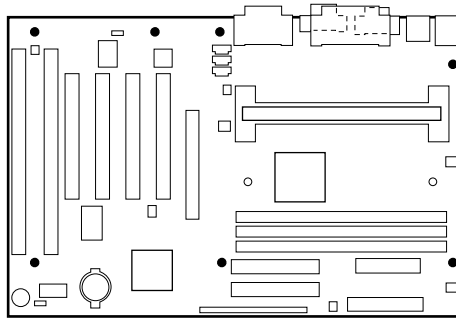
You will need a Phillips (#2 bit) screwdriver.

Refer to Appendix B for regulatory requirements and installation instructions and precautions.



WARNING

This procedure should be done only by qualified technical personnel. Disconnect the computer from its power source before doing the procedures described here. Failure to disconnect the power before you open the computer can result in personal injury or equipment damage.



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Figure 3. Mounting Screw Holes

How to Install a Processor

To install a processor, in brief you must:

1. Install the retention mechanism.
2. Install the processor.
3. Set the processor speed.

Detailed instructions follow for each of these procedures.

⇒ NOTE

If you are installing a boxed Intel Pentium II processor, see the instructions on page 23.

Install the Retention Mechanism

To install the retention mechanism, follow these steps:

1. Observe the precautions in “Before You Begin” (see page 17).
2. Find the Slot 1 connector on the motherboard (see Figure 4).

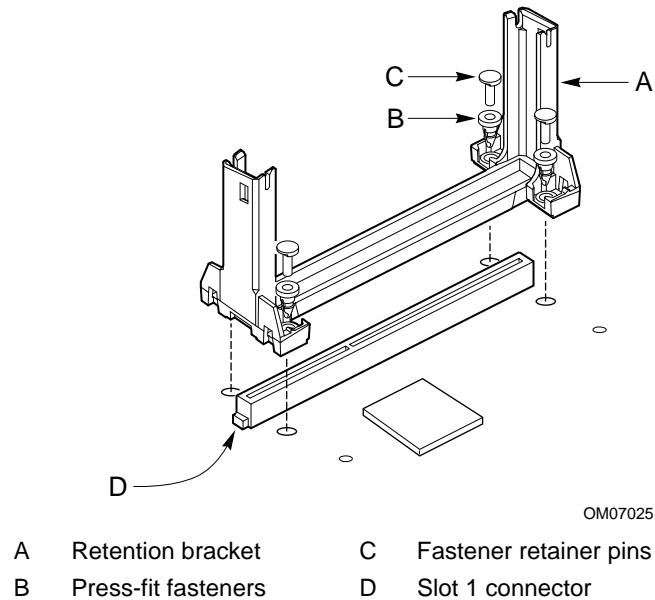


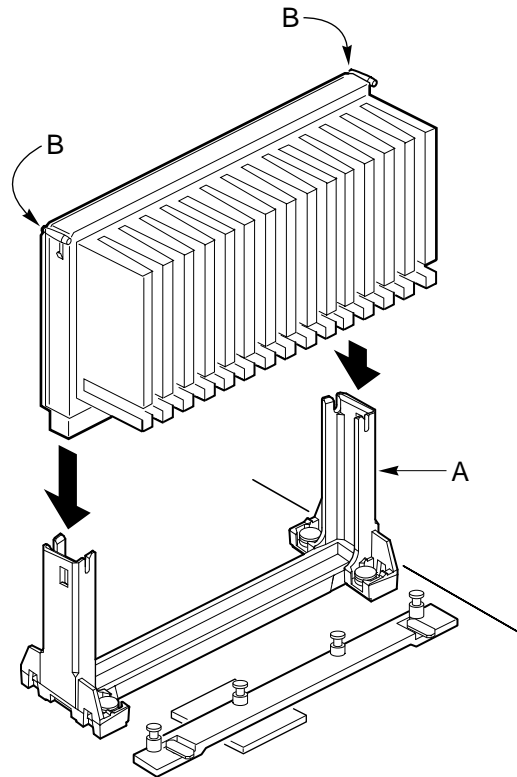
Figure 4. Installing the Processor Retention Mechanism

3. Orient the retention bracket so the tab of the Slot 1 connector matches the corresponding cutout in the retention bracket, then position the retention bracket on the motherboard.
4. Push each of the four fasteners through its mounting hole in the retention bracket, and then through the motherboard mounting hole until you feel it snap into place.
5. Push a fastener retainer pin into the through hole of fastener until it is fully seated against the top of the fastener. Repeat this step for each of the four fasteners.

Install the Processor

To install the processor, follow these steps:

1. Insert the processor in the retention mechanism as shown in Figure 5.
2. Press down on the processor until it is firmly seated in the Slot 1 connector and the latches on the processor lock into place.



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- A Retention mechanism
B Latches

Figure 5. Installing the Processor

- Slide the top heatsink support bar onto the retaining pins of the support's base as shown in Figure 6.

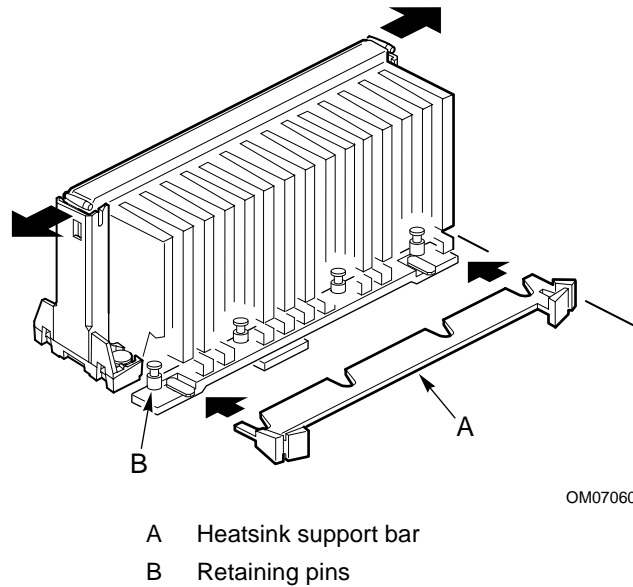


Figure 6. Installing the Heatsink Support Top Bar

How to Set the Processor Speed

Set the processor speed after you have installed or upgraded the processor. This procedure assumes that the motherboard is installed in the computer and the configuration jumper block is set to normal mode.

Figure 7 shows the location of the configuration jumper block on the motherboard. The jumper is set to normal mode at the factory.

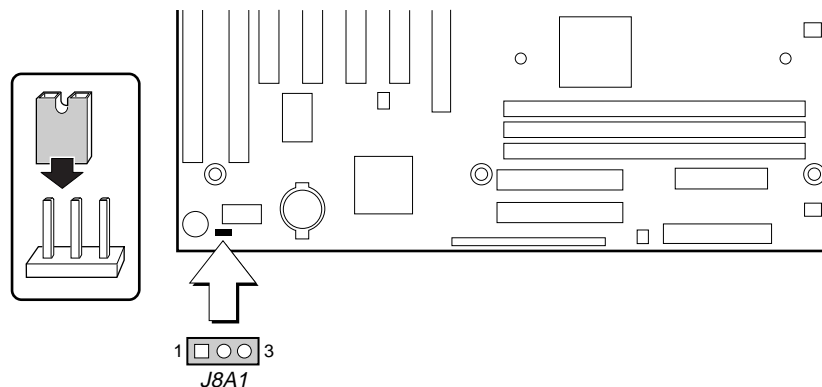


Figure 7. Location of the Configuration Jumper Block



CAUTION

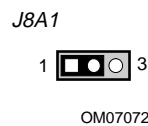
To avoid bending or breaking pins, use caution when removing or installing a jumper.

To set the processor speed, follow these steps:

1. Observe the precautions in “Before You Begin” (see page 17).
2. Turn off all peripheral devices connected to the computer. Turn off the computer.
3. Remove the computer cover.
4. Find the configuration jumper block (see Figure 7).
5. Place the jumper on pins 2-3 as shown below.



6. Replace the cover, turn on the computer, and allow it to boot.
7. The computer starts the Setup program. Setup displays the Maintenance menu.
8. Use the arrow keys to select the Processor Speed feature and press <Enter>. Setup displays a popup screen with the available processor speeds.
9. Use the arrow keys to select the processor speed. For example, select 266 for a 266 MHz Pentium II processor. Press <Enter> to confirm the speed. This Maintenance menu reappears again.
10. Press <F10> to save the current values and exit Setup.
11. Turn off the computer.
12. Remove the computer cover.
13. To restore normal operation, place the jumper on pins 1-2 as shown below.



14. Replace the cover and turn on the computer.
15. Verify the processor speed during POST.

How to Upgrade to a Boxed Pentium® II Processor

Use the instructions in this section to prepare the motherboard for a boxed Pentium II processor upgrade.

To prepare for a boxed Pentium II processor upgrade, in brief you must:

1. Remove the heatsink support top bar and the installed processor.
2. Remove the heatsink support base.
3. Upgrade the processor.

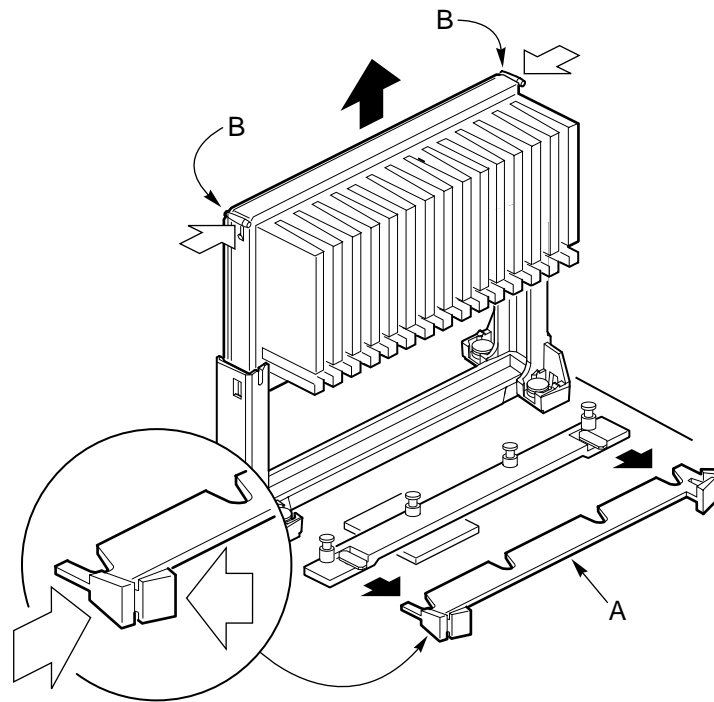
Detailed instructions follow for each of these procedures.

Remove the Installed Processor

To remove the installed processor, follow these steps:

1. Observe the precautions in “Before You Begin” (see page 17).
2. Turn off all peripheral devices connected to the computer. Turn off the computer.
3. Remove the computer cover.
4. Remove the motherboard from the computer chassis. (See “How to Install and Remove the Motherboard.”)
5. Place the motherboard on a flat work surface and remove any components that block access to the installed processor.

6. Remove the top bar of the heatsink support from the base as shown in Figure 8. Press in on the latches to release the top bar.



- A Heatsink support top bar
B Latches

Figure 8. Removing the Heatsink Support Top Bar and the Processor



CAUTION

Pressing on the motherboard or components while removing the processor can cause damage. If necessary, you can safely press on the motherboard's plastic connectors to gain leverage while removing the processor.

7. Remove the processor by pressing in on the latches and pulling the processor straight up as shown in Figure 8. Place the processor aside.

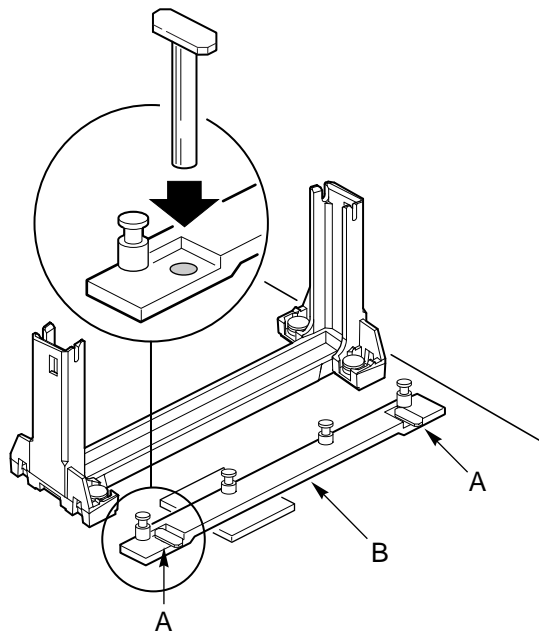
Remove the Heatsink Support Base

➡ NOTE

To remove the heatsink support base from the motherboard, you need a special removal tool (MID #58982) that is available from Dexter Design (call 503-648-7000 for ordering information).

To remove the heatsink support base, follow these steps:

1. With your fingers, remove the two retention pins from the heatsink support base as shown in Figure 9.

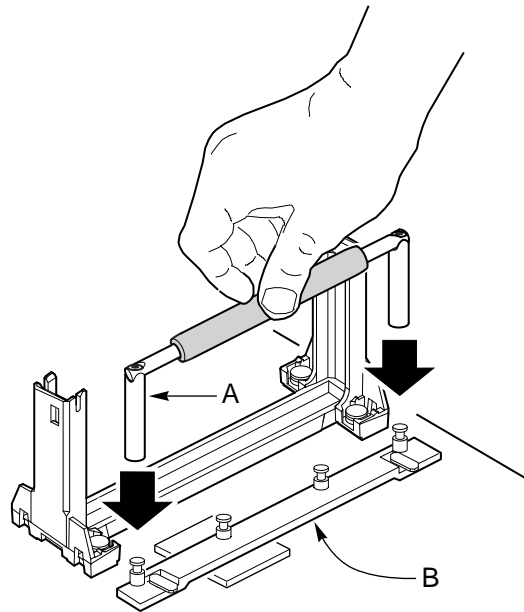


OM07024

- A Retention pins
B Heatsink support base

Figure 9. Removing the Heatsink Support Retention Pins

2. Place the heatsink support removal tool over the two outside posts of the heatsink support base as shown in Figure 10. Make sure the tool completely engages the posts.

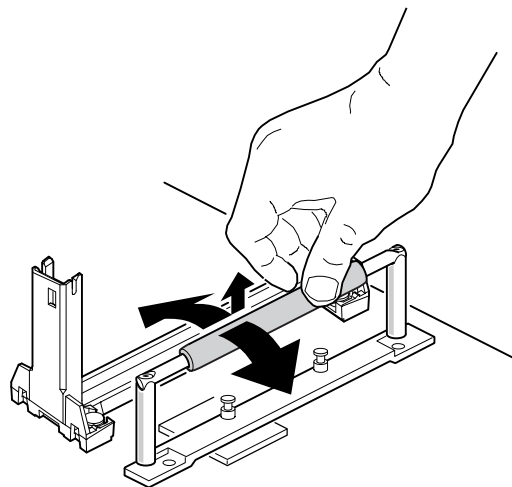


OM07058

- A Heatsink support removal tool
B Heatsink support base

Figure 10. Placing the Heatsink Support Base Removal Tool on the Retention Pins

3. Carefully rock the tool back and forth until the heatsink support base disengages from the holes in the motherboard (as shown in Figure 11). There is an audible click when the base disengages from the motherboard.



OM07057

Figure 11. Using the Heatsink Support Base Removal Tool

4. Remove the tool and the heatsink support base from the motherboard.

Upgrade the Processor

See the documentation that came with the boxed Intel Pentium II processor.

How to Install Memory

You can install from 8 MB to 384 MB of memory in the motherboard DIMM sockets. The board has DIMM sockets arranged as banks 0, 1, and 2. The motherboard supports the following memory features:

- 168-pin DIMMs with gold-plated contacts
- 66 or 100 MHz SDRAM
- Non-ECC (64-bit) and ECC (72-bit) memory
- 3.3 V memory only
- Single- or double-sided DIMMs in the following sizes:

| DIMM Size | Non-ECC Configuration | ECC Configuration |
|-----------|-----------------------|-------------------|
| 8 MB | 1 Mbit x 64 | 1 Mbit x 72 |
| 16 MB | 2 Mbit x 64 | 2 Mbit x 72 |
| 32 MB | 4 Mbit x 64 | 4 Mbit x 72 |
| 64 MB | 8 Mbit x 64 | 8 Mbit x 72 |
| 128 MB | 16 Mbit x 64 | 16 Mbit x 72 |

When adding memory, follow these guidelines:

- You can install DIMMs in any of the three banks.
- You can use different sizes of DIMMs in different banks.
- The BIOS detects the size and type of installed memory.
- For ECC operation to be available, all installed memory must be ECC and you must enable the ECC Configuration feature in the Setup program (see Chapter 3).

⇒ NOTE

All memory components and DIMMs used with the SE440BX motherboard must comply with the PC SDRAM specifications. These include: the PC SDRAM Specification (memory component specific), the PC Unbuffered DIMM Specification, and the PC Serial Presence Detect Specification. You can access these documents through the Internet at:

<http://www.intel.com/design/pcisets/memory/>

Figure 12 shows the location of the DIMM sockets.

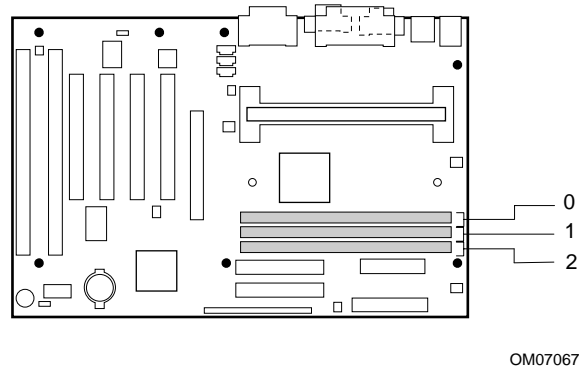


Figure 12. Location of DIMM Sockets

To install DIMMs, follow these steps:

1. Observe the precautions in “Before You Begin” (see page 17).
2. Turn off all peripheral devices connected to the computer. Turn off the computer.
3. Remove the computer cover and locate the DIMM sockets.
4. Holding the DIMM by the edges, remove it from its antistatic package.
5. Make sure the clips at either end of the socket are pushed away from the socket.
6. Position the DIMM above the socket. Align the two small notches in the bottom edge of the DIMM with the keys in the socket.
7. Insert the bottom edge of the DIMM into the socket (see Figure 13).
8. When the DIMM is seated, push down on the top edge of the DIMM until the retaining clips snap into place. Make sure the clips are firmly in place.
9. Replace the computer cover.
10. If you installed a DIMM with ECC memory, turn on the computer and use the ECC Configuration feature in Setup to enable ECC (see Chapter 3).

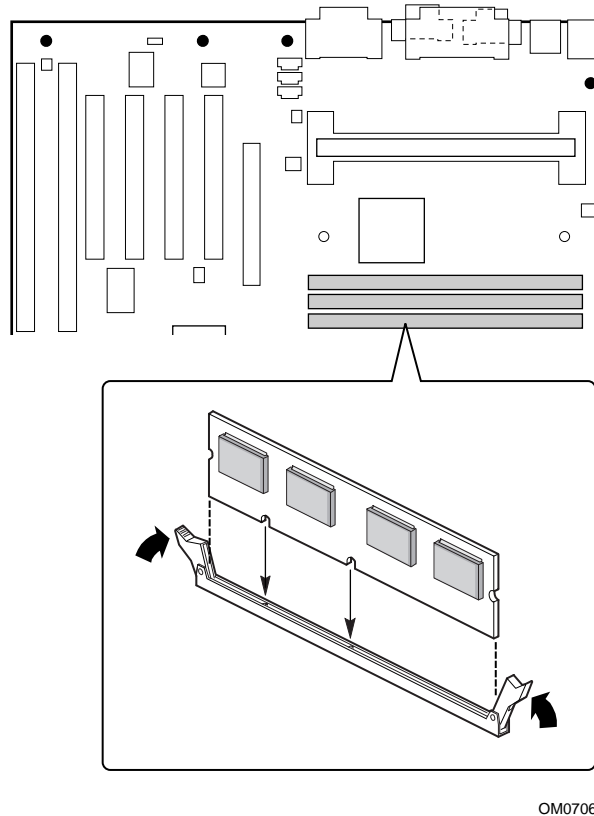


Figure 13. Installing a DIMM

How to Remove Memory

To remove a DIMM, follow these steps:

1. Observe the precautions in "Before You Begin" (see page 17).
2. Turn off all peripheral devices connected to the computer. Turn off the computer.
3. Remove the computer cover.
4. Gently spread the retaining clips at each end of the socket. The DIMM pops out of the socket.
5. Hold the DIMM by the edges, lift it away from the socket, and store it in an antistatic package.
6. Reinstall and reconnect any parts you removed or disconnected to reach the DIMM sockets.

How to Replace the Battery

When your computer is turned off, a lithium battery maintains the current time-of-day clock and the values in CMOS RAM current. Figure 14 shows the location of the battery.

The battery should last about seven years. When the battery begins to die, it loses voltage; when the voltage drops below a certain level, the Setup program settings stored in CMOS RAM (for example, the date and time) might not be accurate. Replace the battery with an equivalent one.



WARNING

Danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Discard used batteries according to manufacturer's instructions.



ATTENTION

Il y a danger d'explosion s'il y a remplacement incorrect de la batterie. Remplacer uniquement avec une batterie du même type ou d'un type recommandé par le constructeur. Mettre au rebut les batteries usagées conformément aux instructions du fabricant.



ADVARSEL!

Lithiumbatteri - Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.



ADVARSEL

Lithiumbatteri - Eksplosjonsfare. Ved utskifting benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres apparatleverandøren.



VARNING

Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

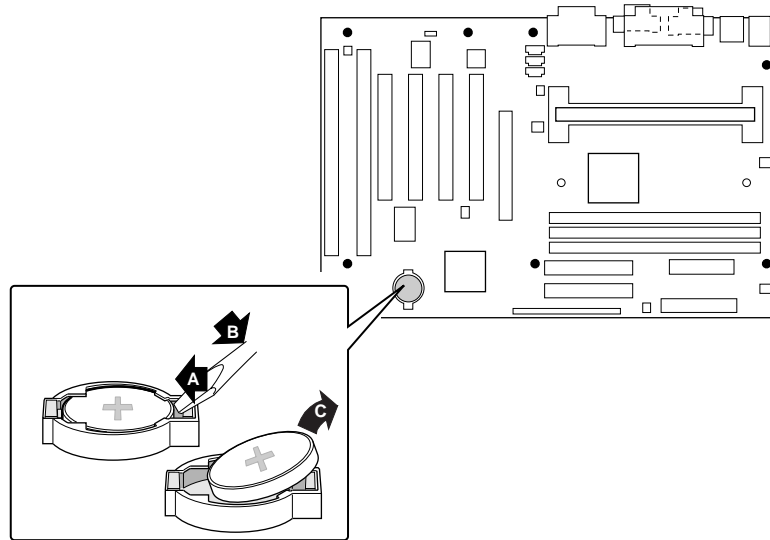


VAROITUS

Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

To replace the battery, follow these steps:

1. Observe the precautions in “Before You Begin” (see page 17).
2. Turn off all peripheral devices connected to the computer. Turn off the computer.
3. Remove the computer cover.
4. Locate the battery on the motherboard (see Figure 14).
5. With a medium flat-bladed screwdriver, gently pry the battery free from its socket. Note the orientation of the “+” and “-” on the battery.
6. Install the new battery in the socket, orienting the “+” and “-” correctly.
7. Replace the computer cover.



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Figure 14. Replacing the Battery

⇒ **NOTE**

If your local ordinances permit, you may dispose of individual batteries as normal trash. Do not expose batteries to excessive heat or fire. Keep all batteries away from children.

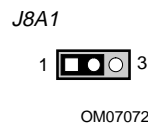
How to Clear the Passwords

This procedure assumes that the motherboard is installed in the computer and the configuration jumper block is set to normal mode.

1. Observe the precautions in “Before You Begin” (see page 17).
2. Turn off all peripheral devices connected to the computer. Turn off the computer.
3. Remove the computer cover.
4. Find the configuration jumper block (see Figure 7).
5. Place the jumper on pins 2-3 as shown below.



6. Replace the cover, turn on the computer, and allow it to boot.
7. The computer starts the Setup program. Setup displays the Maintenance menu.
8. Use the arrow keys to select Clear Passwords. Press <Enter> and Setup displays a pop-up screen requesting that you confirm clearing the password. Select Yes and press <Enter>. Setup displays the Maintenance menu again.
9. Press <F10> to save the current values and exit Setup.
10. Turn off the computer.
11. Remove the computer cover.
12. To restore normal operation, place the jumper on pins 1-2 as shown below.



13. Replace the cover and turn on the computer.

3 Using the Setup Program

This chapter provides an overview of the Setup program. You can use the Setup program to change the configuration information and boot sequence for the computer.

⇒ NOTE

For reference purposes, you should write down the current Setup settings. When you make changes to the settings, update this record.

Setup Program Modes

The Setup program has three modes of operation:

- Normal mode for normal operations
- Configure mode for configuring the processor speed and clearing passwords (see Chapter 2 for how to do both tasks)
- Recovery mode for recovering the BIOS data

The Setup program operating mode is controlled by the setting of the configuration jumper block J8A1 (see Figure 7). The jumper is set to normal mode at the factory.

Table 1 shows jumper settings for the different Setup modes.

Table 1. Jumper Settings for Setup Program Modes

| Mode | Jumper | Description |
|-----------|--------|---|
| Normal | 1-2 | BIOS uses current configuration and passwords for booting. |
| Configure | 2-3 | After the POST runs, Setup starts and displays the Maintenance menu. This menu displays options for setting the processor speed and clearing passwords. |
| Recovery | None | BIOS recovers data from a recovery diskette. Refer to Chapter 4 for information on recovering the BIOS data during an upgrade. |

Setup Menus

To enter the Setup program, turn the computer on and press <F2> when you see the message:

Press <F2> Key if you want to run SETUP

Table 2 is an overview of the menu screens in the Setup program.

Table 2. Setup Menu Bar

| Setup Menu Screen | Description |
|-------------------|--|
| Maintenance | Specifies the processor speed and clears the Setup passwords. This menu is only available in configure mode. Refer to Section 1.15 for information about configure mode. |
| Main | Allocates resources for hardware components. |
| Advanced | Specifies advanced features available through the chipset. |
| Security | Specifies passwords and security features. |
| Power | Specifies power management features. |
| Boot | Specifies boot options and power supply controls. |
| Exit | Saves or discards changes to the Setup program options. |

Function Keys

Table 3 shows the function keys available for menu screens.

Table 3. Setup Function Keys

| Setup Key | Description |
|------------------------|---|
| <F1> or <Alt-H> | Brings up a help screen for the current item. |
| <Esc> | Exits the menu. |
| <←> or <→> | Selects a different menu screen. |
| <↑> or <↓> | Moves cursor up or down. |
| <Home> or <End> | Moves cursor to top or bottom of the window. |
| <PgUp> or <PgDn> | Moves cursor to top or bottom of the window. |
| <F5> or <-> | Selects the previous value for a field. |
| <F6> or <+> or <Space> | Selects the next value for a field. |
| <F9> | Load the default configuration values for the current menu. |
| <F10> | Save the current values and exit Setup. |
| <Enter> | Executes command or selects the submenu. |

Maintenance Menu

This menu is for setting the processor speed and clearing the Setup passwords. Setup only displays this menu in configure mode. See page 33 for information about setting configure mode.

Table 4. Maintenance Menu

| Feature | Options | Description |
|---------------------|--|---|
| Processor Speed | <ul style="list-style-type: none"> • 233 • 266 • 300 • 333 • 350 • 400 | <p>Specifies the processor speed in megahertz. This setup screen will only show speeds up to and including the maximum speed of the processor installed on the motherboard.</p> <ul style="list-style-type: none"> • With a host bus operating at 66 MHz, the board supports processors at the following speeds: 233, 266, 300, and 333 MHz. • With a host bus operating at 100 MHz, the board supports processors at the following speeds: 300, 350 and 400 MHz. |
| Clear All Passwords | No options | Clears the user and supervisor passwords. |

Main Menu

This menu reports processor and memory information and is for configuring the system date and system time.

Table 5. Main Menu

| Feature | Options | Description |
|---|---|---|
| BIOS Version | No options | Displays the version of the BIOS. |
| Processor Type | No options | Displays processor type. |
| Processor Speed | No options | Displays processor speed. |
| Cache RAM | No options | Displays size of second-level cache. |
| System Memory | No options | Displays the total amount of RAM on the motherboard. |
| Memory Bank 0 Memory Bank 1 Memory Bank 2 | No options | Displays size and type of DIMM installed in each memory bank. |
| Language | <ul style="list-style-type: none"> • English (US) (default) • Italian • Francais • Deutch • Espanol | Selects the default language used by the BIOS. |
| ECC Configuration | <ul style="list-style-type: none"> • Non-ECC (default) • ECC | Specifies ECC memory operation. |
| System Time | Hour, minute, and second | Specifies the current time. |
| System Date | Month, day, and year | Specifies the current date. |

Advanced Menu

This menu is for setting advanced features that are available through the chipset.

Table 6. Advanced Menu

| Feature | Options | Description |
|--------------------------|--|--|
| Plug & Play O/S | <ul style="list-style-type: none"> • No (default) • Yes | <p>Specifies if a Plug and Play operating system is being used.</p> <p><i>No</i> lets the BIOS configure all devices.</p> <p><i>Yes</i> lets the operating system configure Plug and Play devices. Not required with a Plug and Play operating system.</p> |
| Reset Configuration Data | <ul style="list-style-type: none"> • No (default) • Yes | Clears the BIOS configuration data on the next boot. |
| Numlock | <ul style="list-style-type: none"> • Auto (default) • On • Off | Specifies the power on state of the Num Lock feature on the numeric keypad of the keyboard. |
| Peripheral Configuration | No options | Configures peripheral ports and devices. When selected, displays the Peripheral Configuration submenu. |
| IDE Configuration | No options | Specifies type of connected IDE device. |
| Floppy Configuration | No options | When selected, displays the Floppy Options submenu. |
| DMI Events Logging | No options | Configures DMI Events Logging. When selected, displays the DMI Events Logging submenu. |
| Video Configuration | No options | Configures video features. When selected, displays the Video Configuration submenu. |
| Resource Configuration | No options | Configures memory blocks and IRQs for legacy ISA devices. When selected, displays the Resource Configuration submenu. |

Peripheral Configuration Submenu

This submenu is for the configuring the computer peripherals.

Table 7. Peripheral Configuration Submenu

| Feature | Options | Description |
|------------------|---|---|
| Serial port A | <ul style="list-style-type: none"> Disabled Enabled Auto (default) | <p>Configures serial port A.</p> <p><i>Auto</i> assigns the first free COM port, normally COM1, the address 3F8h and the interrupt IRQ4.</p> <p>An * (asterisk) displayed next to an address indicates a conflict with another device.</p> |
| Base I/O address | <ul style="list-style-type: none"> 3F8 2F8 3E8 2E8 | Specifies the base I/O address for serial port A. |
| Interrupt | <ul style="list-style-type: none"> IRQ 3 IRQ 4 (default) | Specifies the interrupt for serial port A. |
| Serial port B | <ul style="list-style-type: none"> Disabled Enabled Auto (default) | <p>Configures serial port B.</p> <p><i>Auto</i> assigns the first free COM port, normally COM2, the address 2F8h and the interrupt IRQ3.</p> <p>An * (asterisk) displayed next to an address indicates a conflict with another device.</p> <p>If either serial port address is set, that address will not appear in the list of options for the other serial port.</p> <p>If an <i>ATI mach32[†]</i> or an <i>ATI mach64[†]</i> video controller is active as an add-in card, the COM4, 2E8h address will not appear in the list of options for either serial port.</p> |
| Mode | <ul style="list-style-type: none"> Normal (default) IrDA[†] ASK-IR | Specifies the mode for serial port B for normal (COM 2) or infrared applications. |
| Base I/O address | <ul style="list-style-type: none"> 3F8 2F8 (default) 3E8 2E8 | Specifies the base I/O address for serial port B. |
| Interrupt | <ul style="list-style-type: none"> IRQ 3 (default) IRQ 4 | Specifies the interrupt for serial port B. |

continued ➞

Table 7. Peripheral Configuration Submenu (continued)

| Feature | Options | Description |
|--------------------|--|--|
| Parallel port | <ul style="list-style-type: none"> Disabled Enabled Auto (default) | <p>Configures the parallel port.</p> <p><i>Auto</i> assigns LPT1 the address 378h and the interrupt IRQ7.</p> <p>An * (asterisk) displayed next to an address indicates a conflict with another device.</p> |
| Mode | <ul style="list-style-type: none"> Output Only Bi-directional (default) EPP ECP | <p>Selects the mode for the parallel port.</p> <p><i>Output Only</i> operates in AT[†]-compatible mode.</p> <p><i>Bi-directional</i> operates in bi-directional PS/2-compatible mode.</p> <p><i>EPP</i> is Extended Parallel Port mode, a high-speed bi-directional mode.</p> <p><i>ECP</i> is Enhanced Capabilities Port mode, a high-speed bi-directional mode.</p> |
| Base I/O address | <ul style="list-style-type: none"> 378 278 228 | Specifies the base I/O address for the parallel port. |
| Interrupt | <ul style="list-style-type: none"> IRQ 5 IRQ 7 | Specifies the interrupt for the parallel port. |
| Audio | <ul style="list-style-type: none"> Disabled Enabled (default) | Enables or disables the onboard audio subsystem. |
| Legacy USB Support | <ul style="list-style-type: none"> Disabled (default) Enabled | Enables or disables USB legacy support. (See section 3.1.13 for more information.) |

IDE Configuration

Table 8. IDE Configuration

| Feature | Options | Description |
|----------------------|--|--|
| IDE Controller | <ul style="list-style-type: none"> Disabled Primary Secondary Both (default) | <p>Specifies the integrated IDE controller.</p> <p><i>Primary</i> enables only the Primary IDE Controller.</p> <p><i>Secondary</i> enables only the Secondary IDE Controller.</p> <p><i>Both</i> enables both IDE controllers.</p> |
| Hard Disk Pre-Delay | <ul style="list-style-type: none"> Disabled (default) 3 Seconds 6 Seconds 9 Seconds 12 Seconds 15 Seconds 21 Seconds 30 Seconds | Specifies the hard disk drive pre-delay. |
| Primary IDE Master | No options | Reports type of connected IDE device. When selected, displays the Primary IDE Master submenu. |
| Primary IDE Slave | No options | Reports type of connected IDE device. When selected, displays the Primary IDE Slave submenu. |
| Secondary IDE Master | No options | Reports type of connected IDE device. When selected, displays the Secondary IDE Master submenu. |
| Secondary IDE Slave | No options | Reports type of connected IDE device. When selected, displays the Secondary IDE Slave submenu. |

IDE Configuration Submenus

This submenu is for configuring IDE devices, including:

- Primary IDE master
- Primary IDE slave
- Secondary IDE master
- Secondary IDE slave

Table 9. IDE Configuration Submenus

| Feature | Options | Description |
|------------------------|---|---|
| Type | <ul style="list-style-type: none"> • None • ATAPI Removable • Other ATAPI • CD-ROM • User • IDE Removable • Auto (default) | <p>Specifies the IDE configuration mode for IDE devices.</p> <p><i>User</i> allows the cylinders, heads, and sectors fields to be changed.</p> <p><i>Auto</i> automatically fills in the values for the cylinders, heads, and sectors fields.</p> |
| Maximum Capacity | No options | Reports the maximum capacity for the hard disk. |
| Multi-Sector Transfers | <ul style="list-style-type: none"> • Disabled (default) • 2 Sectors • 4 Sectors • 8 Sectors • 16 Sectors | <p>Specifies number of sectors per block for transfers from the hard drive to memory.</p> <p>Check the hard drive's specifications for optimum setting.</p> |
| LBA Mode Control | <ul style="list-style-type: none"> • Disabled • Enabled (default) | Enables or disables the LBA mode control. |
| Transfer Mode | <ul style="list-style-type: none"> • Standard (default) • Fast PIO 1 • Fast PIO 2 • Fast PIO 3 • Fast PIO 4 • FPIO 3 / DMA 1 • FPIO 4 / DMA 2 | Specifies the method for moving data to/from the drive. |
| Ultra DMA | <ul style="list-style-type: none"> • Disabled (default) • Mode 0 • Mode 1 • Mode 2 | Specifies the Ultra DMA mode for the drive. |

Floppy Options

This submenu is for configuring floppy drives.

Table 10. Floppy Options

| Feature | Options | Description |
|------------------------|---|---|
| Floppy Disk Controller | <ul style="list-style-type: none"> Disabled Enabled (default) | Disables or enables the integrated floppy disk controller. |
| Diskette A: | <ul style="list-style-type: none"> Disabled 360 KB, 5¼" 1.2 MB, 5¼" 720 KB, 3½" 1.44/1.25 MB, 3½" (default) 2.88 MB, 3½" | Specifies the capacity and physical size of diskette drive A. |
| Floppy Write Protect | <ul style="list-style-type: none"> Disabled (default) Enabled | Disables or enables write protect for the diskette drive(s). |

DMI Event Logging

This submenu is for configuring the DMI event logging features.

Table 11. DMI Event Logging Submenu

| Feature | Options | Description |
|--------------------------|--|---|
| Event log capacity | No options | Indicates if there is space available in the event log. |
| Event log validity | No options | Indicates if the contents of the event log are valid. |
| View DMI event log | No options | Enables viewing of DMI event log. |
| Clear all DMI event logs | <ul style="list-style-type: none"> No (default) Yes | Clears the DMI event log after rebooting. |
| Event Logging | <ul style="list-style-type: none"> Disabled Enabled (default) | Enables logging of DMI events. |
| ECC Event Logging | <ul style="list-style-type: none"> Disabled (default) Enabled | Enables logging of ECC events. |
| Mark DMI events as read | No options | Marks all DMI events as read. |

Video Configuration Submenu

This submenu is for configuring video features.

Table 12. Video Configuration Submenu

| Feature | Options | Description |
|-------------------|--|--|
| Palette Snooping | <ul style="list-style-type: none"> Disabled (default) Enabled | Controls the ability of a primary PCI graphics controller to share a common palette with an ISA add-in video card. |
| AGP Aperture Size | <ul style="list-style-type: none"> 64 MB (default) 256 MB | Specifies the aperture size for the A.G.P. video controller. |

Resource Configuration Submenu

This submenu is for configuring the memory and interrupts.

Table 13. Resource Configuration Submenu

| Feature | Options | Description |
|--------------------|--|---|
| Memory Reservation | <ul style="list-style-type: none"> • C800 - CBFF Available (default) Reserved • CC00- CFFF Available (default) Reserved • D000 - D3FF Available (default) Reserved • D400 - D7FF Available (default) Reserved • D800 - DBFF Available (default) Reserved • DC00 - DFFF Available (default) Reserved • Memory hole Disabled (default) Conventional Extended | <p>Reserves specific upper memory blocks for use by legacy ISA devices.</p> <p>Memory hole frees address space in RAM for a legacy ISA board.</p> |
| IRQ Reservation | <ul style="list-style-type: none"> • IRQ3 Available (default) Reserved • IRQ4 Available (default) Reserved • IRQ5 Available (default) Reserved • IRQ7 Available (default) Reserved • IRQ10 Available (default) Reserved • IRQ11 Available (default) Reserved | <p>Reserves specific IRQs for use by legacy ISA devices.</p> <p>An * (asterisk) displayed next to an IRQ indicates an IRQ conflict.</p> |

Security Menu

This menu is for setting passwords and security features.

Table 14. Security Menu

| Feature | Options | Description |
|-------------------------|--|--|
| User Password Is | No options | Reports if there is a user password set. |
| Supervisor Password Is | No options | Reports if there is a supervisor password set. |
| Set User Password | Password can be up to seven alphanumeric characters. | Specifies the user password. |
| Set Supervisor Password | Password can be up to seven alphanumeric characters. | Specifies the supervisor password. |
| Clear User | No Options | Clears the user password. |
| User Setup Access | <ul style="list-style-type: none"> • Disabled • Enabled (default) | <p>Enables or disables User Setup Access.</p> <p><i>Disabled</i> prevents the user from accessing Setup.</p> |
| Unattended Start | <ul style="list-style-type: none"> • Disabled (default) • Enabled | <p>Enables the unattended start feature. When enabled, the computer boots, but the keyboard is locked. The user must enter a password to unlock the computer or boot from a floppy diskette.</p> |

Power Menu

This menu is for setting power management features.

Table 15. Power Menu

| Feature | Options | Description |
|-----------------------|--|---|
| Power Management | <ul style="list-style-type: none"> Disabled Enabled (default) | Enables or disables the BIOS power management feature. |
| Inactivity Timer | <ul style="list-style-type: none"> Off (default) 1 Minute 5 Minutes 10 Minutes 20 Minutes 30 Minutes 60 Minutes 120 Minutes | Specifies the amount of time before the computer enters standby mode. |
| Hard Drive | <ul style="list-style-type: none"> Disabled Enabled (default) | Enables power management for hard disks during standby and suspend modes. |
| VESA Video Power Down | <ul style="list-style-type: none"> Disabled Standby (default) Suspend Sleep | Specifies power management for video during standby and suspend modes. |

Boot Menu

This menu is for setting the boot features and the boot sequence.

Table 16. Boot Menu

| Feature | Options | Description |
|----------------------|---|--|
| Quick Boot Mode | <ul style="list-style-type: none"> Disabled Enabled (default) | Enables the computer to boot without running certain POST tests. |
| Scan User Flash Area | <ul style="list-style-type: none"> Disabled (default) Enabled | Enables the BIOS to scan the flash memory for user binary files that are executed at boot time. |
| After Power Failure | <ul style="list-style-type: none"> Power On (default) Stay Off Last State | <p>Specifies the mode of operation if an AC/Power loss occurs.</p> <p><i>Power On</i> restores power to the computer.</p> <p><i>Stay Off</i> keeps the power off until the power button is pressed.</p> <p><i>Last State</i> restores the previous power state before power loss occurred.</p> |
| On Modem Ring | <ul style="list-style-type: none"> Stay Off Power On (default) | Specifies how the computer responds to an incoming call on an installed modem when the power is off. |
| On LAN | <ul style="list-style-type: none"> Stay Off Power On (default) | Specifies how the computer responds to a LAN wakeup event when the power is off. |
| On PME | <ul style="list-style-type: none"> Stay Off (default) Power On | Specifies how the computer responds to a PME wakeup event when the power is off. |

continued ➞

Table 16. Boot Menu (continued)

| Feature | Options | Description |
|--|---|--|
| First Boot Device Second Boot Device Third Boot Device Fourth Boot Device | <ul style="list-style-type: none"> Removable devices Hard Drive ATAPI CD-ROM Drive Network Boot | <p>Specifies the boot sequence from the available devices. To specify boot sequence:</p> <ol style="list-style-type: none"> Select the boot device with <↑> or <↓>. Press <+> to move the device up the list or <-> to move the device down the list. <p>The operating system assigns a drive letter to each boot device in the order listed. Changing the order of the devices changes the drive lettering.</p> |
| Hard Drive | No options | Lists available hard drives. When selected, displays the Hard Drive submenu. |
| Removable Devices | No options | Lists available removable devices. When selected, displays the Removable Devices submenu. |

Hard Drive Submenu

This submenu is for configuring the boot sequence for hard drives.

Table 17. Hard Drive Submenu

| Options | Description |
|--|---|
| <ul style="list-style-type: none"> Bootable Add in Card | <p>Specifies the boot sequence for the hard drives attached to the computer. To specify boot sequence:</p> <ol style="list-style-type: none"> Select the boot device with <↑> or <↓>. Press <+> to move the device up the list or <-> to move the device down the list. <p>The operating system assigns a drive letter to each device in the order listed. Changing the order of the devices changes the drive lettering.</p> |

Removable Devices Submenu

This submenu is for configuring the boot sequence for removable devices.

Table 18. Removable Devices Submenu

| Options | Description |
|--|---|
| <ul style="list-style-type: none"> Legacy Floppy Drives | <p>Specifies the boot sequence for the removable devices attached to the computer. To specify boot sequence:</p> <ol style="list-style-type: none"> Select the boot device with <↑> or <↓>. Press <+> to move the device up the list or <-> to move the device down the list. <p>The operating system assigns a drive letter to each device in the order listed. Changing the order of the devices changes the drive lettering.</p> |

Exit Menu

This menu is for exiting the Setup program, saving changes, and loading and saving defaults.

Table 19. Exit Menu

| Feature | Description |
|-------------------------|--|
| Exit Saving Changes | Exits and saves the changes in CMOS RAM. |
| Exit Discarding Changes | Exits without saving any changes made in Setup. |
| Load Setup Defaults | Loads the factory default values for all the Setup options. |
| Load Custom Defaults | Loads the custom defaults for Setup options. |
| Save Custom Defaults | Saves the current values as custom defaults. Normally, the BIOS reads the Setup values from flash memory. If this memory is corrupted, the BIOS reads the custom defaults. If no custom defaults are set, the BIOS reads the factory defaults. |
| Discard Changes | Discards changes without exiting Setup. The option values present when the computer was turned on are used. |

4 Upgrading the BIOS

This chapter describes how to upgrade the BIOS and how to recover the BIOS if an upgrade fails.

Preparing for the Upgrade

Before you upgrade the BIOS, prepare by:

- Obtaining the BIOS upgrade file
- Recording the current BIOS settings
- Creating a bootable diskette
- Creating the BIOS upgrade diskette

Obtaining the BIOS Upgrade File

You can upgrade to a new version of the BIOS by using the BIOS upgrade file. The BIOS upgrade file is a compressed self-extracting archive that contains all the files you need to upgrade the BIOS. The BIOS upgrade file contains:

- New BIOS files
- BIOS recovery files
- Intel Flash Memory Update Utility

You can obtain the BIOS upgrade file through your computer supplier or from the Intel World Wide Web site:

<http://developer.intel.com/>

⇒ NOTE

Please review the instructions distributed with the update utility before attempting a BIOS upgrade.

The Intel Flash Memory Update Utility allows you to:

- Upgrade the BIOS in flash memory.
- Update the language section of the BIOS.

Recording the Current BIOS Settings

1. Boot the computer and press <F2> when you see the message:

Press <F2> Key if you want to run SETUP

NOTE

Do not skip step 2. You will need these settings to configure your computer at the end of the upgrade procedure.

2. Write down the current settings in the BIOS Setup program.

Creating a Bootable Diskette

⇒ NOTE

If your drive A is an LS-120 diskette drive, you must use a 1.44-MB diskette as the bootable BIOS upgrade diskette. The computer is unable to recover a BIOS from an LS-120 diskette.

1. Use a DOS or Windows 95 system to create the diskette.
2. Insert a diskette in diskette drive A.
3. At the C:\ prompt, for an unformatted diskette, type:

```
format a:/s
```

or, for a formatted diskette, type:

```
sys a:
```

4. Press <Enter>.

Creating the BIOS Upgrade Diskette

Obtain the BIOS upgrade file as described in “Obtaining the BIOS Upgrade File” and then:

1. Then copy the BIOS upgrade file to a temporary directory on your hard disk.
2. From the C:\ prompt, change to the temporary directory.
3. To extract the file, type the name of the BIOS upgrade file, for example:

```
10006BI1.EXE
```

4. Press <Enter>. The extracted file contains the following files:

```
LICENSE.TXT
```

```
BIOINSTR.TXT
```

```
BIOS.EXE
```

5. Read the LICENSE.TXT file, which contains the software license agreement, and the BIOINSTR.TXT file, which contains the instructions for the BIOS upgrade.
6. Insert the bootable diskette into drive A.
7. To extract the BIOS.EXE file to the diskette, change to the temporary directory that holds the BIOS.EXE file and type:

```
BIOS A:
```

8. Press <Enter>.
9. The diskette now holds the new BIOS files, the Intel Flash Update Utility, and the recovery files.

Upgrading the BIOS

1. Boot the computer with the BIOS upgrade diskette in drive A. The flash memory update utility screen appears.
2. Select Update Flash Memory From a File.
3. Select Update System BIOS. Press <Enter>.
4. Use the arrow keys to select the correct .bio file. Press <Enter>.

5. When the utility asks for confirmation that you want to flash the new BIOS into memory, select `Continue with Programming`. Press `<Enter>`.
6. When the utility displays the message `upgrade is complete`, remove the diskette. Press `<Enter>`.
7. As the computer boots, check the BIOS identifier (version number) to make sure the upgrade was successful.
8. To enter the BIOS Setup program, press `<F2>` when you see the message:
 Press `<F2>` Key if you want to run SETUP
9. For proper operation, load the BIOS Setup program defaults. To load the defaults, press `<F9>`.
10. To accept the defaults, press `<Enter>`.
11. In Setup, set the options to the settings you wrote down before beginning the BIOS upgrade.
12. To save the settings, press `<F10>`.
13. To accept the settings, press `<Enter>`.
14. Turn off the computer and reboot.

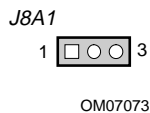
Recovering the BIOS

It is unlikely that anything will interrupt the BIOS upgrade; however, if an interruption occurs, the BIOS could be damaged. The following steps explain how to recover the BIOS if an upgrade fails. The following procedure uses recovery mode for the Setup program. See Chapter 3 for more information on Setup modes.

NOTE

Because of the small amount of code available in the non-erasable boot block area, there is no video support. You will not see anything on the screen during this procedure. Monitor the procedure by listening to the speaker and looking at the diskette drive LED.

1. Turn off the computer, disconnect the computer's power cord, and disconnect all external peripherals.
2. Remove the computer cover and locate the configuration jumper block (J8A1) (see Figure 7).
3. Remove the jumper from all pins as shown below to set recovery mode for Setup.



4. Insert the bootable BIOS upgrade diskette into diskette drive A.
5. Replace the computer cover, connect the power cord, turn on the computer, and allow it to boot. The recovery process will take a few minutes.
6. Listen to the speaker.
 - Two beeps and the end of activity in drive A indicate successful BIOS recovery.
 - A series of continuous beeps indicates failed BIOS recovery.
7. If recovery fails, return to step 1 and repeat the recovery process.
8. If recovery is successful, turn off the computer and disconnect its power cord.
9. Remove the computer cover and continue with the following steps.

10. On the jumper block (J8A1), move the jumper back to pins 1-2 as shown below to set normal mode for Setup.



11. Leave the upgrade diskette in drive A, replace the computer cover, and connect the computer's power cord.
12. Turn on the computer and continue with the BIOS upgrade (see page 46).

Changing the BIOS Language

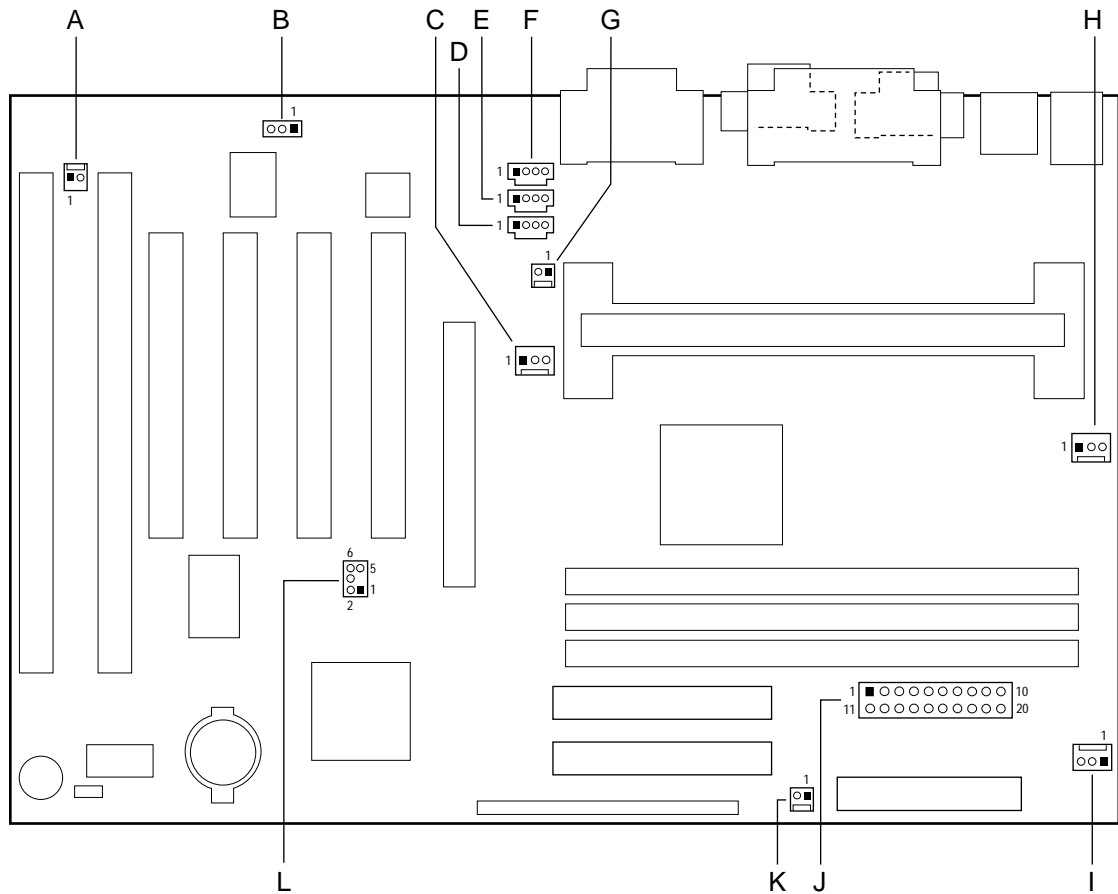
You can use the BIOS upgrade utility to change the language the BIOS uses for messages and the Setup program. Use a bootable diskette containing the Intel Flash Memory Update Utility and language files (see "Upgrading the BIOS" on page 46).

1. Boot the computer with the bootable diskette in drive A. The BIOS upgrade utility screen appears.
2. Select `Update Flash Memory From a File`.
3. Select `Update Language Set`. Press `<Enter>`.
4. Select drive A and use the arrow keys to select the correct `.lng` file. Press `<Enter>`.
5. When the utility asks for confirmation that you want to flash the new language into memory, select `Continue with Programming`. Press `<Enter>`.
6. When the utility displays the message `upgrade is complete`, remove the diskette. Press `<Enter>`.
7. The computer will reboot and the changes will take effect.

5 Technical Reference

Motherboard Connectors

Figure 15 shows the location of some of the motherboard connectors.



OM07066

| | | | |
|---|-----------------------------------|---|------------------------------|
| A | Wake on Ring | G | Chassis intrusion (optional) |
| B | Wake on LAN technology (optional) | H | Fan 2 |
| C | Fan 3 | I | Fan 1 |
| D | Auxiliary Line In (optional) | J | Power supply |
| E | Telephony (optional) | K | SCSI LED (optional) |
| F | CD audio (optional) | L | PC/PCI |

Figure 15. Motherboard Connectors

Table 20. Wake on Ring Connector

| Pin | Signal Name |
|-----|-------------|
| 1 | Ground |
| 2 | RINGA# |

Table 21. Wake on LAN Technology Connector

| Pin | Signal Name |
|-----|-------------|
| 1 | +5 VSB |
| 2 | Ground |
| 3 | WOL |

Table 22. Fan 3 Connector

| Pin | Signal Name |
|-----|------------------|
| 1 | Ground |
| 2 | FAN_CTRL (+12 V) |
| 3 | Ground |

Table 23. Auxiliary Line In Connector

| Pin | Signal Name |
|-----|--------------------------|
| 1 | Left Line In |
| 2 | Ground |
| 3 | Ground |
| 4 | Right Line In (monaural) |

Table 24. Telephony Connector

| Pin | Signal Name |
|-----|---------------------------|
| 1 | Audio In (monaural) |
| 2 | Ground |
| 3 | Ground |
| 4 | Mic preamp Out (to modem) |

Table 25. CD Audio Connector

| Pin | Signal Name |
|-----|-------------|
| 1 | CD_IN-Left |
| 2 | Ground |
| 3 | Ground |
| 4 | CD_IN-Right |

Table 26. Chassis Intrusion Connector

| Pin | Signal Name |
|-----|-------------|
| 1 | Ground |
| 2 | CHS_SEC |

Table 27. Fan 2 Connector

| Pin | Signal Name |
|-----|-------------|
| 1 | Ground |
| 2 | +12 V |
| 3 | FAN_SEN* |

* If the optional hardware monitor is not available, pin 3 is ground.

Table 28. Fan 1 Connector

| Pin | Signal Name |
|-----|------------------|
| 1 | Ground |
| 2 | FAN_CTRL (+12 V) |
| 3 | FAN_SEN* |

* If the optional hardware monitor is not available, pin 3 is ground.

Table 29. Power Supply Connector

| Pin | Signal Name | Pin | Signal Name |
|-----|--------------------|-----|---|
| 1 | +3.3 V | 11 | +3.3 V |
| 2 | +3.3 V | 12 | -12 V |
| 3 | Ground | 13 | Ground |
| 4 | +5 V | 14 | PS-ON# (power supply remote on/off control) |
| 5 | Ground | 15 | Ground |
| 6 | +5 V | 16 | Ground |
| 7 | Ground | 17 | Ground |
| 8 | PWRGD (Power Good) | 18 | -5 V |
| 9 | +5 VSB | 19 | +5 V |
| 10 | +12 V | 20 | +5 V |

Table 30. SCSI LED Connector

| Pin | Signal Name |
|-----|-------------|
| 1 | DRV_ACT# |
| 2 | No connect |

Table 31. PC/PCI Connector

| Pin | Signal Name | Pin | Signal Name |
|-----|-------------|-----|-------------|
| 1 | P_PCIGNTA# | 2 | Ground |
| 3 | No connect | 4 | P_PCIREQA# |
| 5 | Ground | 6 | SER_IRQ |

Front Panel Connectors

The motherboard has connectors for controls and indicators typically located on the front panel of the computer.

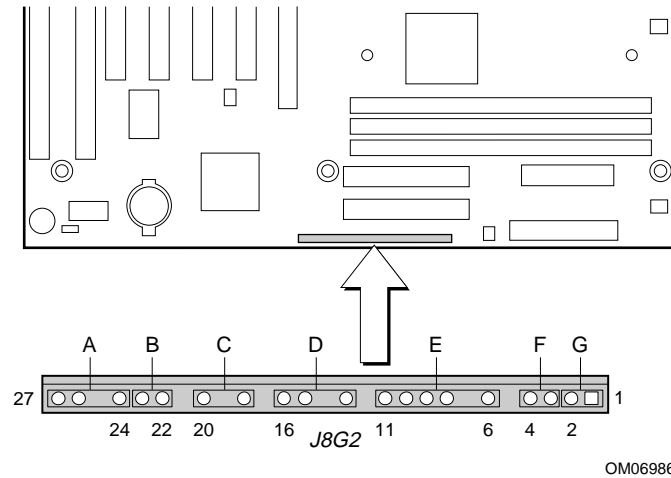


Figure 16. Front Panel Connectors

Table 32. Front Panel I/O Connectors

| Connector | Pin | Signal Name | Connector | Pin | Signal Name |
|----------------------------------|-----|-------------------|----------------------------------|-----|-------------|
| A. Offboard Speaker (SPEAKER) | 27 | +5 V | | 13 | +5 V |
| | 26 | +5 V | none | 12 | Key |
| | 25 | Key | E. Infrared (IrDA) (INFRARED) | 11 | IR_SL1 |
| | 24 | PC_SPKR# | | 10 | IR_TX |
| B. Reset (RESET) | 23 | FP_RESET | | 9 | Ground |
| | 22 | Ground | | 8 | IrR_RX |
| none | 21 | Key | | 7 | Key |
| C. Sleep/Power LED (PWR/LED) | 20 | PWR_LED1 (green) | | 6 | +5 V |
| | 19 | Key | none | 5 | Key |
| | 18 | PWR_LED0 (yellow) | F. Sleep/Resume (SLEEP) | 4 | Ground |
| none | 17 | Key | | 3 | SLEEP_REQ |
| D. Hard Drive LED (HD LED) | 16 | HD_PWR | G. Power On (PWR ON) | 2 | Ground |
| | 15 | HD Active# | | 1 | SW_ON# |
| | 14 | Key | | | |

Motherboard Resources

Memory Map

Table 33. Memory Map

| Address Range (decimal) | Address Range (hex) | Size | Description |
|-------------------------|---------------------|--------|---|
| 1024 K - 393216 K | 100000 - 18000000 | 383 MB | Extended memory |
| 928 K - 1024 K | E8000 - FFFFF | 96 KB | System BIOS |
| 896 K - 928 K | E0000 - E7FFF | 32 KB | System BIOS (available as UMB) |
| 800 K - 896 K | C8000 - DFFFF | 96 KB | Available high DOS memory (open to ISA and PCI buses) |
| 640 K - 800 K | A0000 - C7FFF | 160 KB | Video memory and BIOS |
| 0 K - 640 K | 00000 - 9FFFF | 640 KB | Conventional memory |

DMA Channels

Table 34. DMA Channels

| DMA Channel Number | Data Width | System Resource |
|--------------------|---------------|-------------------------------|
| 0 | 8- or 16-bits | Audio |
| 1 | 8- or 16-bits | Audio/parallel port |
| 2 | 8- or 16-bits | Diskette drive |
| 3 | 8- or 16-bits | Parallel port (for ECP)/audio |
| 4 | | Reserved - cascade channel |
| 5 | 16-bits | Open |
| 6 | 16-bits | Open |
| 7 | 16-bits | Open |

I/O Map

Table 35. I/O Map

| Address (hex) | Size | Description |
|-------------------|----------|---|
| 0000 - 000F | 16 bytes | DMA controller 1 |
| 0020 - 0021 | 2 bytes | Interrupt controller 1 |
| 002E - 002F | 2 bytes | Super I/O controller configuration registers |
| 0040 - 0043 | 4 bytes | Counter/Timer 1 |
| 0048 - 004B | 4 bytes | Counter/Timer 2 |
| 0060 | 1 byte | Keyboard controller |
| 0061 | 1 byte | NMI, speaker control |
| 0064 | 1 byte | Keyboard controller |
| 0070 - 0071 | 2 bytes | Real time clock controller |
| 0080 - 008F | 16 bytes | DMA page registers |
| 00A0 - 00A1 | 2 bytes | Interrupt controller 2 |
| 00B2 - 00B3 | 2 bytes | APM control |
| 00C0 - 00DE | 31 bytes | DMA controller 2 |
| 00F0 - 00FF | 16 bytes | Numeric processor |
| 0170 - 0177 | 8 bytes | Secondary IDE controller |
| 01F0 - 01F7 | 8 bytes | Primary IDE controller |
| 0200 - 0207 | 8 bytes | Audio / game port / joy stick |
| 0220 - 022F | 16 bytes | Audio (Sound Blaster compatible) |
| 0228 - 022F | 8 bytes | LPT3 |
| 0278 - 027F | 8 bytes | LPT2 |
| 02E8 - 02EF | 8 bytes | COM4/Video (8514A) |
| 02F8 - 02FF | 8 bytes | COM2 |
| 0330 - 0331 | 2 bytes | MPU-401 (MIDI) |
| 0376 - 0377 | 2 bytes | Secondary IDE controller |
| 0120 - 0127 | 8 bytes | Audio controller |
| 0274 - 0277 | 4 bytes | I/O read data port for ISA Plug and Play enumerator |
| 0378 - 037F | 8 bytes | LPT1 |
| 0388 - 038D | 6 bytes | AdLib [†] (FM synthesizer) |
| 03B0 - 03BB | 12 bytes | Video (monochrome) |
| 03C0 - 03DF | 32 bytes | Video (VGA [†]) |
| 03E8 - 03EF | 8 bytes | COM3 |
| 03F0 - 03F5, 03F7 | 7 bytes | Diskette controller |
| 03F6 | 1 byte | Primary IDE controller |
| 03F8 - 03FF | 8 bytes | COM1 |
| 04D0 - 04D1 | 2 bytes | Edge/level triggered PIC |
| 0530 - 0537 | 8 bytes | Windows Sound System |
| LPT n + 400h | 8 bytes | ECP port, LPT n base address + 400h |
| 0CF8 - 0CFF* | 8 bytes | PCI configuration registers |
| 0CF9** | 1 byte | Turbo and reset control register |

* DWORD access only

** Byte access only

PCI Configuration Space Map

Table 36. PCI Configuration Space Map

| Bus Number (hex) | Device Number (hex) | Function Number (hex) | Description |
|------------------|---------------------|-----------------------|---|
| 00 | 00 | 00 | Intel 82443BX (PAC) |
| 00 | 01 | 00 | Intel 82443BX (PAC) A.G.P. bus |
| 00 | 07 | 00 | Intel 82371EB (PIIX4E) PCI/ISA bridge |
| 00 | 07 | 01 | Intel 82371EB (PIIX4E) IDE bus master |
| 00 | 07 | 02 | Intel 82371EB (PIIX4E) USB |
| 00 | 07 | 03 | Intel 82371EB (PIIX4E) power management |
| 00 | 0B | 00 | Audio/multimedia controller |
| 00 | 0D | 00 | PCI expansion slot 1 (J4D2) |
| 00 | 0E | 00 | PCI expansion slot 2 (J4D1) |
| 00 | 0F | 00 | PCI expansion slot 3 (J4C1) |
| 00 | 10 | 00 | PCI expansion slot 4 (J4B1) |

Interrupts

Table 37. Interrupts

| IRQ | System Resource |
|-----|--|
| NMI | I/O channel check |
| 0 | Reserved, interval timer |
| 1 | Reserved, keyboard buffer full |
| 2 | Reserved, cascade interrupt from slave PIC |
| 3 | COM2* |
| 4 | COM1* |
| 5 | LPT2 (Plug and Play option)/audio/user available |
| 6 | Diskette drive controller |
| 7 | LPT1* |
| 8 | Real time clock |
| 9 | Reserved |
| 10 | USB/User available |
| 11 | Windows Sound System*/user available |
| 12 | Onboard mouse port (if present, else user available) |
| 13 | Reserved, math coprocessor |
| 14 | Primary IDE (if present, else user available) |
| 15 | Secondary IDE (if present, else user available) |

* Default, but can be changed to another IRQ

A Error Messages

BIOS Beep Codes

One long beep followed by several short beeps indicates a video problem.

Table 38. Beep Codes

| Beeps | Port 80h Code | Explanation |
|---------|---------------|---|
| 1-2-2-3 | 16h | BIOS ROM checksum |
| 1-3-1-1 | 20h | Test DRAM refresh |
| 1-3-1-3 | 22h | Test Keyboard Controller |
| 1-3-3-1 | 28h | Autosize DRAM |
| 1-3-3-2 | 29h | Initialize POST Memory Manager |
| 1-3-3-3 | 2Ah | Clear 512 KB base RAM |
| 1-3-4-1 | 2Ch | RAM failure on address line xxxx |
| 1-3-4-3 | 2Eh | RAM failure on data bits xxxx of low byte of memory bus |
| 1-4-1-1 | 30h | RAM failure on data bits xxxx of high byte of memory bus |
| 2-1-2-2 | 45h | POST device initialization |
| 2-1-2-3 | 46h | Check ROM copyright notice |
| 2-2-3-1 | 58h | Test for unexpected interrupts |
| 2-2-4-1 | 5Ch | Test RAM between 512 and 640 KB |
| 1-2 | 98h | Search for option ROMs. One long, two short beeps on checksum failure |

BIOS Error Messages

Table 39. BIOS Error Messages

| Error Message | Explanation |
|--|--|
| Diskette drive A error | Drive A is present but fails the POST diskette tests. Check that the drive is defined with the proper diskette type in Setup and that the diskette drive is installed correctly. |
| Extended RAM Failed at offset: <i>nnnn</i> | Extended memory not working or not configured properly at offset <i>nnnn</i> . |
| Failing Bits: <i>nnnn</i> | The hexadecimal number <i>nnnn</i> is a map of the bits at the RAM address (System, Extended, or Shadow memory) that failed the memory test. Each 1 in the map indicates a failed bit. |

continued ➞

Table 39. BIOS Error Messages (continued)

| Error Message | Explanation |
|---|--|
| Fixed Disk 0 Failure or Fixed Disk 1 Failure or Fixed Disk Controller Failure | Fixed disk is not working or not configured properly. Check to see if fixed disk is installed properly. Run Setup to be sure the fixed-disk type is correctly identified. |
| Incorrect Drive A type - run SETUP | Type of diskette drive for drive A not correctly identified in Setup. |
| Invalid NVRAM media type | Problem with NVRAM (CMOS) access. |
| Keyboard controller error | The keyboard controller failed test. Try replacing the keyboard. |
| Keyboard error | Keyboard not working. |
| Keyboard error nn | BIOS discovered a stuck key and displayed the scan code nn for the stuck key. |
| Keyboard locked - Unlock key switch | Unlock the system to proceed. |
| Monitor type does not match CMOS - Run SETUP | Monitor type not correctly identified in Setup. |
| Operating system not found | Operating system cannot be located on either drive A or drive C. Enter Setup and see if fixed disk and drive A are properly identified. |
| Parity Check 1 | Parity error found in the system bus. BIOS attempts to locate the address and display it on the screen. If it cannot locate the address, it displays ????. |
| Parity Check 2 | Parity error found in the I/O bus. BIOS attempts to locate the address and display it on the screen. If it cannot locate the address, it displays ????. |
| Press <F1> to resume, <F2> to Setup | Displayed after any recoverable error message. Press <F1> to start the boot process or <F2> to enter Setup and change any settings. |
| Real time clock error | Real-time clock fails BIOS test. May require motherboard repair. |
| Shadow RAM Failed at offset: nnnn | Shadow RAM failed at offset <i>nnnn</i> of the 64 KB block at which the error was detected. |
| System battery is dead - Replace and run SETUP | The CMOS clock battery indicator shows the battery is dead. Replace the battery and run Setup to reconfigure the system. |
| System cache error - Cache disabled | RAM cache failed the BIOS test. BIOS disabled the cache. |
| System CMOS checksum bad - run SETUP | System CMOS RAM has been corrupted or modified incorrectly, perhaps by an application program that changes data stored in CMOS. Run Setup and reconfigure the system either by getting the default values and/or making your own selections. |
| System RAM Failed at offset: nnnn | System RAM failed at offset <i>nnnn</i> of the 64 KB block at which the error was detected. |
| System timer error | The timer test failed. Requires repair of system motherboard. |

nnnn = hexadecimal number

B Regulatory and Integration Information

This appendix contains:

- Safety standards, electromagnetic compatibility regulations, and product certification markings for this motherboard
- Instructions and precautions for integrators who are installing this motherboard in a chassis

Regulatory Compliance

This motherboard complies with the following safety and EMC regulations when correctly installed in a compatible host system.

Table 40. Safety Regulations

| Regulation | Title |
|---|---|
| UL 1950 - CSA 950-95, 3rd edition, Dated 07-28-95 | The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (USA and Canada) |
| EN 60 950, 2nd Edition, 1992 (with Amendments 1, 2, and 3) | The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (European Union) |
| IEC 950, 2nd edition, 1991 (with Amendments 1, 2, 3, and 4) | The Standard for Safety of Information Technology Equipment including Electrical Business Equipment. (International) |
| EMKO-TSE (74-SEC) 207/94 | Summary of Nordic deviations to EN 60 950. (Norway, Sweden, Denmark and Finland) |

Table 41. EMC Regulations

| Regulation | Title |
|-----------------------------|---|
| FCC Class B | Title 47 of the Code of Federal Regulations, Parts 2 and 15, Subpart B, pertaining to unintentional radiators. (USA) |
| CISPR 22, 2nd Edition, 1993 | Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (International) |
| EN 55 022, 1995 | Limits and methods of measurement of Radio Interference Characteristics of Information Technology Equipment. (Europe) |
| EN 50 082-1 (1992) | Generic Immunity Standard; Currently compliance is determined via testing to IEC 801-2, -3, and -4. (Europe) |
| VCCI Class B (ITE) | Implementation Regulations for Voluntary Control of Radio Interference by Data Processing Equipment and Electronic Office Machines. (Japan) |
| ICES-003, Issue 2 | Interference-Causing Equipment Standard, Digital Apparatus. (Canada) |

Product Certification Markings

This printed circuit board assembly has the following product certification markings:

- European CE Marking: Consists of a marking on the board and shipping container.
- UL Recognition Mark: Consists of the UL File No. E139761 on the component side of the board and the PB No. on the solder side of the board. Board material flammability is 94V-1 or -0.
- Each board will be marked with an FCC Declaration of Conformity.
- Canadian Compliance: Consists of small c followed by a stylized backward UR on component side of the board.

Installation Precautions

When you install and test the motherboard, observe all warnings and cautions in the installation instructions.

To avoid injury, be careful of:

- Sharp pins on connectors
- Sharp pins on printed circuit assemblies
- Rough edges and sharp corners on the chassis
- Hot components (like processors, voltage regulators, and heat sinks)
- Damage to wires that could cause a short circuit

Observe all warnings and cautions that instruct you to refer computer servicing to qualified technical personnel.



WARNING

Do not open the power supply. Risk of electric shock and burns from high voltage and rapid overheating. Refer servicing of the power supply to qualified technical personnel.

Installation Instructions



CAUTION

Follow these guidelines to meet safety and regulatory requirements when installing this board assembly.

Read and adhere to all of these instructions and the instructions supplied with the host computer and associated modules. If the instructions for the host computer are inconsistent with these instructions or the instructions for associated modules, contact the supplier's technical support to find out how you can ensure that your computer meets safety and regulatory requirements. If you do not follow these instructions and the instructions provided by host computer and module suppliers, you increase safety risk and the possibility of noncompliance with regional laws and regulations.

Ensure Electromagnetic Compatibility (EMC)

Before computer integration, make sure that the power supply and other modules have passed EMC testing using a motherboard with a microprocessor from the same family and operating at the same (or higher) speed as the microprocessor on this motherboard.

In the installation instructions for the host chassis, power supply, and other modules pay close attention to the following:

- Certifications
- External I/O cable shielding and filtering
- Mounting, grounding, and bonding requirements
- Keying connectors when mismatching of connectors could be hazardous

If the power supply and other modules have not passed applicable EMC testing before integration, EMC testing must be conducted on a representative sample of the newly completed computer.

Ensure Host Computer and Accessory Module Certifications

Make sure that the host computer, any added subassembly, such as a board or drive assembly, and internal or external wiring, are certified for the region(s) where the end-product will be used. Marks on the product are proof of certification. Certification marks are as follows:

In Europe

The CE marking signifies compliance with all relevant European requirements. If the host computer does not bear the CE marking, obtain a supplier's Declaration of Conformity to the appropriate standards required by the European EMC Directive and Low Voltage Directive. Other directives, such as the Machinery and Telecommunications Directives, may also apply depending on the type of product. No regulatory assessment is necessary for low voltage DC wiring used internally or wiring used externally when provided with appropriate overcurrent protection.

Appropriate protection is provided by a maximum 8-Amp current limiting circuit or a maximum 5-Amp fuse or positive temperature coefficient (PTC) resistor. All Intel motherboards now have PTCs on all external ports that provide DC power externally.

In the United States

A certification mark by a Nationally Recognized Testing Laboratory (NRTL) such as UL, CSA, or ETL signifies compliance with safety requirements. External wiring must be UL Listed and suitable for the intended use. Internal wiring must be UL Listed or Recognized and rated for applicable voltages and temperatures. The FCC mark (Class A for commercial or industrial only or Class B for residential) signifies compliance with electromagnetic interference requirements.

In Canada

A nationally recognized certification mark such as CSA or cUL signifies compliance with safety requirements. No regulatory assessment is necessary for low voltage DC wiring used internally or wiring used externally when provided with appropriate overcurrent protection. Appropriate protection is provided by a maximum 8-Amp current limiting circuit or a maximum 5-Amp fuse or positive temperature coefficient (PTC) resistor. All Intel motherboards now have PTCs on all external ports that provide DC power externally.

Prevent Power Supply Overload

Unless the power supply has inherent overcurrent protection, do not overload the power supply output. To avoid overloading the power supply, make sure that the calculated total current load of all the modules within the computer is less than the output current rating of the power supply. If you do not do this, the power supply could overheat, catch fire, or damage the insulation that separates hazardous AC line circuitry from low-voltage user accessible circuitry. If the load drawn by a module cannot be determined by the markings and instructions supplied with the module, contact the module supplier's technical support.

Place Battery Marking on the Computer

There is insufficient space on this motherboard to provide instructions for replacing and disposing of the battery. The following warning must be placed permanently and legibly on the host computer as near as possible to the battery.



WARNING

Danger of explosion if battery is incorrectly replaced.

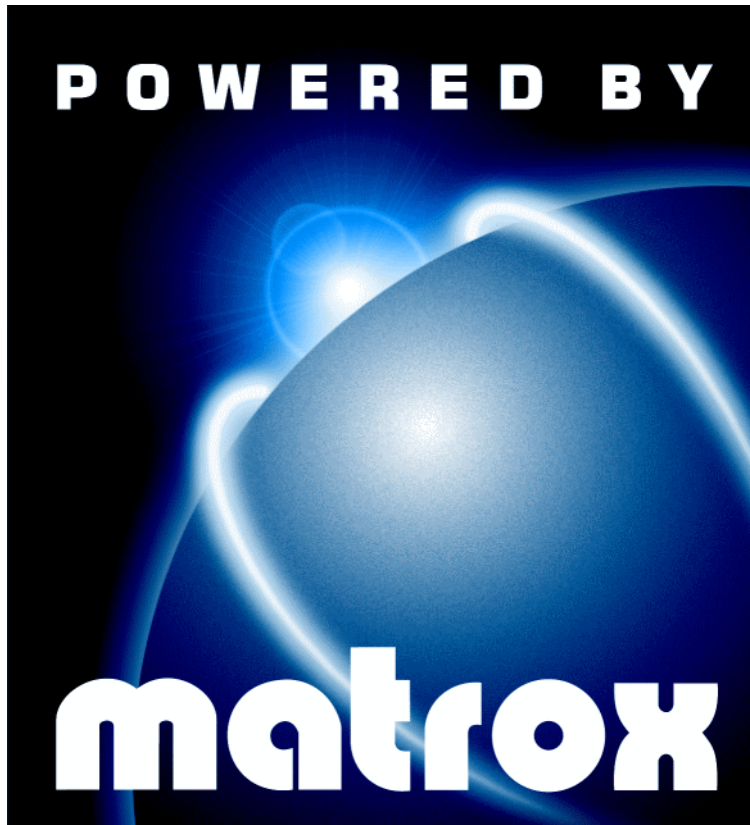
Replace with only the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Use Only for Intended Applications

This product was evaluated for use in computers that will be installed in offices, homes, schools, computer rooms, and similar locations. The suitability of this product for other applications, (such as medical, industrial, alarm systems, and test equipment) may require further evaluation.



Matrox Graphics Architecture



Matrox Graphics Card • Installation Guide •

10526-101-0300
1998.02.06

ENGLISH

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Using this guide

This guide assumes you're familiar with basic functions like click, right-click and double-click, and that you're familiar with the basics of the operating system you're using. Also, we use the following conventions:

- **Bold** for text that appears on-screen, subheadings and labels.
- *Italics* for file names, paths, publication titles, and new terms.
- ***Bold Italic*** for emphasis.
- Keyboard keys in square brackets, with a plus sign separating keys that you press simultaneously. For example: press [Ctrl]+[Alt]+[Del] to restart your computer.
- Arrows ("→") to separate ordered directions. For example, "click **OK** → **Close** → **OK**" is the same as "click **OK**, then click **Close**, then click **OK**".
- When viewing online, [green](#) for cross-references and [underlined green](#) for links to Web pages. Click green text to jump to what is being referenced. (To jump to Web pages, your system first needs to have full Internet access.)

More information

We provide additional documentation in Help files, *readme* files, and Adobe Acrobat PDF (Portable Document Format) files. To view or print PDF files, use the **Acrobat Reader** program, which you can install from the "Matrox Installation" CD-ROM. This guide is available on the CD-ROM as a PDF file (*doc\inst_en.pdf*). The online version of this guide has additional information, including the following sections: "Hardware information", "Customer support", "Warranty" and "Software license agreement".

For context-sensitive Help where available, click the " " icon in the title bar, then click the item you want help on. Right-click a Help topic for a pop-up menu that lets you print or copy it.

Overview

Thank you for purchasing a Matrox graphics card. Your Matrox Millennium II, Mystique 220, or G100 series card is a high-performance graphics card that plugs into an expansion slot inside your personal computer. Matrox's 64-bit graphics engine gives you superior performance with Windows, digital video and 3D graphics. To further accelerate 3D programs, your Matrox card uses bus mastering and has hardware-accelerated features, including texture mapping, Gouraud shading and Z-buffering. Depending on the model of your Matrox card, it supports display resolutions up to 1800×1440 and 1920×1200 .

Your Matrox graphics card is 100% VGA compatible and supports all VESA standards: VBE 2.0 (Super VGA modes), DPMS (energy saving), and DDC-2B (Plug-and-Play monitor).

Also, depending on the model of your Matrox card, you can upgrade it with more RAM or multimedia hardware add-ons. For more information on available upgrades, see the Matrox Web site (www.matrox.com/mga).

Software supplied

- **MGA PowerDesk for Windows 95:** MGA display drivers; DirectDraw, DirectVideo and Direct3D support; **Settings, Monitor, Color, Hot Keys** and **Information** property sheets; **MGA Desktop Navigator** and **MGA QuickDesk** programs; online documentation
- **MGA PowerDesk for Windows NT 4.0:** MGA display drivers; DirectDraw and OpenGL support; **Settings, Monitor, Information, Performance** and **PowerDesk** property sheets; **MGA Desktop Navigator** and **MGA QuickDesk** programs; online documentation
- Microsoft DirectX 5
- Adobe Acrobat Reader for Windows
- Online documentation
- Various third-party software

Installation overview

- 1 Install the hardware – see “[Hardware installation](#)”, page 5.
- 2 Install the software – see “[Software installation](#)”, page 7.

Hardware installation

WARNING – Static electricity can severely damage electronic parts. Take these precautions:

- Before touching any electronic parts, drain the static electricity from your body. You can do this by touching the metal frame of your computer.
- Don't remove a card from the anti-static container it was shipped in until you're ready to install it. When you remove a card from your computer, place it back in its container.
- When handling a card, hold it by its edges, and avoid touching its circuitry.

1 Switch to the standard VGA display driver

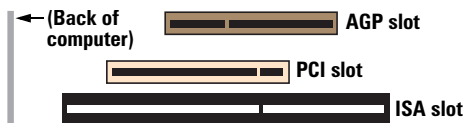
If you're running Windows 95 on your computer, this step is not necessary. If you're using another operating system (for example, Windows NT 4.0), see its documentation for how to switch to VGA mode.

2 Open your computer and remove your existing graphics card

Turn off your computer and all peripherals such as the monitor or printer. Open the computer and remove your existing graphics card. (If you have a display adapter built into your computer's motherboard, it should automatically disable itself after your Matrox card is installed.)

3 Choose an expansion slot

Most computers have different types of expansion slots. Choose an AGP or PCI slot, depending on the type of Matrox graphics card you have. Your system manual should identify the location of each type of expansion slot in your computer.

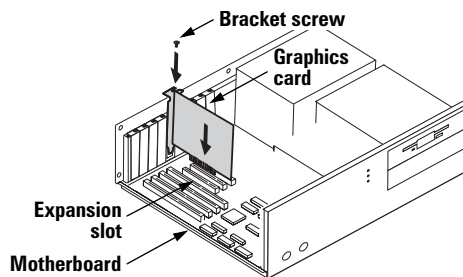


WARNING: Inserting your Matrox card into the wrong slot could damage your card, your computer, or both.

If you have an AGP card, *don't* insert the plastic tab next to the connector pins into the slot.

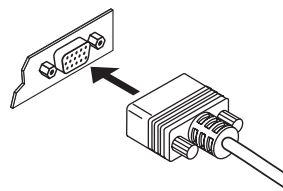
4 Insert your Matrox card

Remove the cover for the slot you intend to use. Save the screw for the mounting bracket. Position your Matrox card over the expansion slot you've chosen. Push the card in firmly and evenly until it's fully seated in the slot. Replace the screw to secure the bracket of your Matrox card to the computer frame.



5 Connect the monitor

Simply plug your monitor cable into the monitor connector on your Matrox card. Make sure the other end of the monitor cable is properly connected to your monitor. See your monitor manual for more information.



6 Restart your computer

7 Install the software

If you're using Windows 95, it detects new hardware when you restart. If Matrox display drivers haven't been previously installed, Windows 95 reports finding a PCI adapter (even if you have an AGP card).

- If you see the **New Hardware Found** dialog box, click "**Do not install a driver**", then **OK**.*
- If you see the **Update Device Driver Wizard** dialog box, click **Next**, then **Finish**.

At this point, Windows is using a display driver that doesn't fully support your Matrox graphics card. To install Matrox display drivers *and* other software, see "[Software installation](#)", page 7.

If you're using Windows NT 4.0, see "[Software installation](#)", page 7.

* If you prefer, you can select "**Driver from disk provided by hardware manufacturer**" to install the Matrox display drivers from the root folder of the "Matrox Installation" CD-ROM.

Software installation

This section describes how to install Matrox software for *Windows 95* and *Windows NT 4.0*.

- 1 Insert the “Matrox Installation” CD-ROM in your CD-ROM drive – the *mgasetup* program automatically starts. This setup program works with Windows 95 and Windows NT 4.0, and detects which operating system you’re using.
- 2 Select the language you want to use, then click **Next**.
- 3 To see notes on the contents of the CD-ROM, click **View ReadMe**. To continue, click **Next**.
- 4 If this is a first-time installation, the setup program lists drivers that are not installed. To begin the software installation, click **Install**.
- 5 Choose an installation type:
 - To install the complete MGA PowerDesk (recommended), click **Typical**.
 - To customize the PowerDesk installation, click **Custom**.

If you click **Custom**, the setup program prompts you for a destination folder and what PowerDesk options you want to install.

After you choose, the setup program automatically installs Matrox software and drivers. After this is done, leave the CD-ROM in your CD-ROM drive, then click **OK** to restart your computer and for all changes to take effect.




- 6 After you restart your computer, the CD-ROM setup program starts again. The main menu lists other software you can install from the CD-ROM. To install, select an item, click **Install**, then follow the on-screen instructions. After the installation of an item is finished, you can return to the main menu to install another. Click **Exit** when you’re done.

If this is a first-time installation, your display is using a 640 × 480 resolution with 256 colors – supported by most monitors. To adjust software monitor settings:

- for Windows 95, see “Software setup – Windows 95”, page 8.
- for Windows NT 4.0, see “Software setup – Windows NT 4.0”, page 10.

Software setup – Windows 95

To access PowerDesk programs and online documentation, click  **Start** → **Programs** → **MGA PowerDesk**.

Monitor setup

To check your monitor settings

1 Right-click the Windows desktop background, then click the **Properties** menu item → **Monitor** tab.

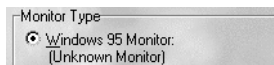
2 If you have a Plug-and-Play monitor:

Make sure the **Windows 95 Monitor** button is selected. If this button is selected, the MGA display driver *automatically* uses the correct settings for your monitor.



If you don't have a Plug-and-Play monitor:

If the monitor type listed under the **Windows 95 Monitor** button is incorrect or shows **Unknown Monitor**, you should select a monitor.



To select a monitor, click the **MGA Monitor** button, select your monitor by name in the list below this button, then click **OK**. If your monitor doesn't appear in the list, you can try the Windows 95 method of monitor selection. For more information on monitor selection, see the MGA PowerDesk online guide.

Note: Many Plug-and-Play monitors do not automatically report if they're capable of 1152 × 864, or 1600 × 1200 and higher display resolutions. To use these resolutions, or higher refresh rates than those reported by the monitor, you can use the MGA monitor selection method.

WARNING: If incorrect software monitor settings are applied, *some* monitors can be permanently damaged. For more information, see your monitor manual.

Display setup


After checking your monitor's software settings, you can change your display resolution, color palette and other MGA PowerDesk settings. To access MGA display property sheets, right-click the Windows desktop background, then click the **Properties** menu item. To change your display resolution or color palette, click the **Settings** tab. For more information on changing your display settings, see the MGA PowerDesk online guide.

Software overview

MGA PowerDesk for Windows 95 includes

- Display driver with:
 - DirectDraw, DirectVideo and Direct3D support for direct access to Matrox hardware.
 - Plug-and-Play (DDC-2B) and Energy Star (DPMS) support.
- **Settings** property sheet to change your display settings. Use this sheet to access MGA PowerDesk features such as:
 - Desktop mode buttons to set up a proportional, horizontal or vertical *virtual desktop*.
 - Display schemes to easily switch to a pre-defined display setting.
 - **Performance** property sheet to change MGA display driver performance settings.
 - **Utilities** property sheet to configure MGA PowerDesk options.
- **Monitor** property sheet to inform the MGA display driver of your monitor's capabilities. You can use this sheet instead of the Windows 95 method of monitor selection.
- **Color** property sheet to change your display's color balance.
- **Hot Key** property sheet to define keyboard shortcuts for:
 - CenterWINDOW to center your view area on the active window.
 - MaxVIEW to resize the active program window to the size of your current display area.
 - PanEND to move your display area to the right or bottom of your virtual desktop.
 - PanHOME to move your display area to the left or top of your virtual desktop.
 - PanLOCK to enable or disable panning.
 - PixelTOUCH to magnify part of your desktop area.
- **Information** property sheet for information on your display hardware and software.
- **MGA Desktop Navigator** program to quickly move the view area of your desktop and for quick access to the PixelTOUCH zoom, PanLOCK and CenterWINDOW features.
- **MGA QuickDesk** menu to quickly switch to a saved display scheme, to save and restore the position of your desktop icons, to open the Windows **Display Properties** dialog box, or to start **MGA Desktop Navigator**. To see this menu, click the monitor icon on the Windows 95 taskbar.
- **MGA Diagnostic** program to identify some possible display-related problems.

Software setup – Windows NT 4.0

To access PowerDesk programs and online documentation, click  **Start** → **Programs** → **MGA NT PowerDesk**.

Monitor setup

To check your monitor settings

1 Right-click the Windows desktop background, then click the **MGA Display Properties** menu item → **Monitor** tab.

2 If you have a Plug-and-Play monitor:



Make sure the **Plug-and-Play (DDC) monitor** button is selected. If so, the MGA display driver *automatically* uses the correct settings for your monitor. If not, click this button, then click **Apply**.

If you don't have a Plug-and-Play monitor:



See if the **Default monitor (60 Hz)** button is selected. If so, use the MGA monitor selection method. For more information on MGA monitor selection, see MGA PowerDesk online guide.

Note: Many Plug-and-Play monitors do not automatically report if they're capable of 1152×864 or 1600×1200 and higher display resolutions. To use these resolutions, or higher refresh rates than those reported by the monitor, you can use the MGA monitor selection method.


WARNING: If incorrect software monitor settings are applied, *some* monitors can be permanently damaged. For more information, see your monitor manual.

Display setup

After checking your monitor's software settings, you can change your display resolution, color palette and other MGA PowerDesk settings. To access MGA display property sheets, right-click the Windows desktop background, then click the **MGA Display Properties** menu item. To change your display resolution or color palette, click the **Settings** tab. For more information on changing your display settings, see the MGA PowerDesk online guide.

Software overview

MGA PowerDesk for Windows NT 4.0 includes

- Display driver with:
 - Multi-display support to use up to 4 monitors at a time (one monitor for each Matrox card – of the same type – in your computer)
 - Accelerated DirectDraw and OpenGL support for direct access to Matrox hardware.
 - Plug-and-Play (DDC-2B) monitor support.
- **Settings** property sheet to change your display settings. This sheet provides access to MGA PowerDesk features such as:
 - Desktop mode buttons to set up a proportional, horizontal or vertical *virtual desktop*.
 - Display schemes to easily switch to a pre-defined display setting.
- **Monitor** property sheet to inform the MGA display driver of your monitor's capabilities.
- **Information** property sheet to display hardware and software version numbers and capabilities.
- **Performance** property sheet to configure advanced driver performance settings.
- **PowerDesk** property sheet with settings for:
 - PixelTOUCH to zoom in and pan on your view area.
 - CenterWINDOW to center opened windows in your view area.
 - MaxVIEW to maximize windows in your view area instead of your desktop.
 - CenterPOPUP to have new windows pop up in the center of your current view area.
- **MGA Desktop Navigator** (DeskNav) program to quickly change the view area of your desktop and give you quick access to the PixelTOUCH zoom and CenterWINDOW features. Access DeskNav through  **Start** → **Programs** → **MGA NT PowerDesk**.
- **MGA QuickDesk** program to quickly switch between your saved display schemes, open the **MGA Display Properties** dialog box or launch **MGA Desktop Navigator**. This program appears as a monitor icon on the Windows NT taskbar.

Troubleshooting

This section contains solutions to problems you may encounter with your Matrox graphics card.

Problem: Computer doesn't boot after Matrox card is installed

Cause There may be another graphics adapter in your computer. (For MGA *multi-display mode* in Windows NT, all other graphics cards in your computer must also be Matrox cards of the same type – Millennium, Millennium II, Mystique 220 **or** G100 series.)

Solution If another graphics card is plugged into an expansion slot, remove it.

Solution If a graphics adapter is built-in to your computer's motherboard, your system may have not automatically disabled it when you inserted your Matrox card. Check your system manual for instructions on how to disable your computer's built-in graphics adapter.

Problem: Wrong color balance, screen image off-center, or no picture at all

Cause Your monitor's video controls may be improperly set.

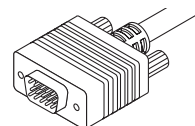
Solution Adjust your monitor's controls (brightness, contrast and so on). For more information, see your monitor manual.

Cause The monitor connections may have been inserted improperly.

Solution Make sure the monitor's power cable is firmly in place.

Solution Make sure the 15-pin connector to your Matrox graphics card is firmly in place.

Solution If your monitor uses a 15-pin connector, make sure the connection to the monitor is firmly in place.

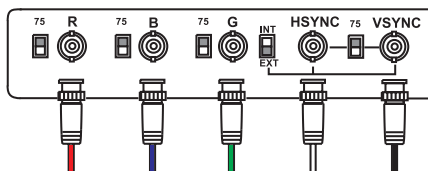


15-pin connector

Solution If your monitor uses BNC input, make sure the Red, Green, Blue, Horizontal Sync (HSYNC – white or gray wire), and Vertical Sync (VSYNC – black wire) connections are firmly in place and plugged into the correct input.

Cause If your monitor uses BNC input, one or more connection settings may be incorrect.

Solution Set each of your monitor's RGB input and sync switches (if available) to 75 ohms, with the sync set to "external". These controls are usually switches on the back of your monitor.



Bayonet Nut Connect (BNC)

Problem: After the startup screen, or after display settings are changed, the screen image is garbled or unusable
(rolling screen images, overlapping screen images or a blank screen)

Cause The MGA display driver may be trying to use settings your monitor doesn't support. This can happen if a monitor was never selected in the software and the display resolution was changed to one your monitor doesn't support, or if the monitor connected to your computer was changed without it being changed in the software.

WARNING: If incorrect software monitor settings are applied, *some* monitors can be permanently damaged. For more information, see your monitor manual.

Solution Windows 95:

- 1 Press [Ctrl]+[Alt]+[Del] twice to restart your computer.
- 2 When you see “**Starting Windows 95...**”, press [F5] to enter “**safe mode**”.
- 3 Right-click the Windows desktop background, then click the **Properties** menu item → **Settings** tab.
- 4 Move the **Display area** slider down to its lowest settings, then click **OK**.
- 5 Restart your computer normally.
- 6 Select a monitor with the **Monitor** property sheet, then you can adjust your display settings. For more information, see the MGA PowerDesk online guide.

Solution Windows NT 4.0:

- 1 Press [Ctrl]+[Alt]+[Del] → [Tab] → [Tab] → [Enter] → [↓] (down arrow) → [Enter] to restart your computer.
- 2 From the startup menu, choose Windows NT 4.0 “**VGA mode**”.
After startup, MGA software prompts you that MGA display drivers are not active; click **OK** to continue.
- 3 Right-click the Windows desktop background, then click the **MGA Display Properties** menu item → **Settings** tab.
Windows may prompt you that the display settings are incorrect for the current mode; click **OK** to continue.
- 4 Move the **Display area** slider down to its lowest settings, then click **OK**.
- 5 Restart your computer normally.
- 6 Select a monitor with the **Monitor** property sheet, then you can adjust your display settings. For more information, see the MGA PowerDesk online guide.

Problem: After game for Windows 95 starts, monitor doesn't display properly (rolling screen images, overlapping screen images or a blank screen)

Cause If your game uses a low-resolution (640 × 480 and below), full-screen display mode, your monitor may not support the refresh rate the MGA driver is using.

Solution

- 1 If the game is still running in full-screen mode, press [Ctrl]+[Alt]+[Del] *once* for the **Close Program** dialog box, and then click the **End Task** button.
- 2 Right-click the Windows desktop background, then click the **Properties** menu item → **Monitor** tab → **MGA Monitor** button.
- 3 From the MGA monitor list, select the monitor model you're using. If your monitor model does not appear in the list, select a monitor that runs at 60 Hz at 640 × 480 (for example, **Standard Monitor Types** → **Vesa 1024X768 @60Hz**). For more information on MGA monitor selection, see online the MGA PowerDesk online guide.
- 4 Click **OK** to apply your selection and close the dialog box.

Problem: 3D program for Windows 95 or Windows NT 4.0 doesn't start or stops running (program uses bus mastering)

Cause Your computer or program may not work well with bus mastering.

Solution Disable bus mastering.

(If you want to continue using bus mastering, see the other solutions.)

Windows 95:

- 1 Right-click the Windows desktop background, then click the **Properties** menu item → **Settings** tab → **PowerDesk** button → **Performance** tab.
- 2 Clear the **Use Bus Mastering** check box.
- 3 Click **OK** → **OK** → **Yes** to accept the changes and restart your computer.

Windows NT 4.0:

- 1 Right-click the Windows desktop background, then click the **MGA Display Properties** menu item → **Performance** tab.
- 2 Clear the **Use Bus Mastering (OpenGL)** check box.
- 3 Click **OK** → **Yes** to accept the changes and restart your computer.

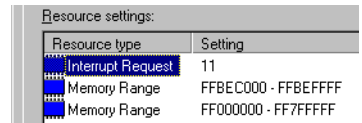
Cause (PCI graphics cards only) Your Matrox card may be in a “slave” expansion slot on a computer that makes a distinction between bus mastering and slave slots.

Solution Change slots. Shut down your computer, disconnect it from the power supply, remove your Matrox card and then insert it into a different PCI expansion slot. For instructions on how to safely install your Matrox card, see “[Hardware installation](#)”, page 5.

Cause Your computer may have not given an interrupt request (IRQ) to your Matrox graphics card or may have given one used by another device in your computer. This may be because your computer’s “Plug-and-Play” feature is turned off.

To check the display adapter’s IRQ (**Windows 95**):

- 1 Right-click the **My Computer** icon on the Windows desktop background, then click the **Properties** menu item → **Device Manager** tab.
- 2 Click the plus sign to the left of the **Display adapters**. An “X” through an icon means the hardware has been disabled. A circled exclamation point through the icon means the hardware has a problem.
- 3 Double-click the name of your Matrox display adapter to open a properties dialog box. The type of problem is displayed in the **General** tab → **Device Status** area. Check also the **Resource** tab → **Resource Settings** list for an **Interrupt Request**.




| Resource type | Setting |
|-------------------|---------------------|
| Interrupt Request | 11 |
| Memory Range | FFBEC000 - FFBEFFFF |
| Memory Range | FF000000 - FF7FFFFF |

Solution Change settings in your computer’s CMOS setup utility.

If your computer has the options of enabling Plug-and-Play detection, or assigning an IRQ to a VGA adapter, make sure they’re enabled. If your computer doesn’t have these options, you may be able to manually assign an IRQ to your graphics card using the CMOS setup utility.

For more information on your computer’s CMOS setup utility, see your system manual or contact your system manufacturer.

Solution Windows 95 (PCI graphics cards only): You may have to manually assign an IRQ to your Matrox card with the *irqset* program in the *C:\Program Files\Matrox MGA PowerDesk* folder. For instructions on how to use *irqset*, see  → **Programs** → **MGA PowerDesk** → **readme**.

Cause Your computer’s other BIOS settings may be incorrect.

Solution Reset your computer’s BIOS settings to the factory defaults using the CMOS setup utility. The factory defaults are usually the “safest” settings. Check your system manual for more information.


Problem: Game for Windows 95 doesn't start or runs slower than normal (program uses Microsoft DirectX interface)

Cause An older version of DirectX may be installed. The “Matrox Installation” CD-ROM setup program installs DirectX as part of the MGA PowerDesk software installation, but some programs install an older version of DirectX (overwriting your version). To see what version of DirectX is installed:

- 1 Right-click the Windows desktop background, then click **Properties** → **Information**.
- 2 Look at the **Microsoft DirectX Version** label.

If DirectX 5.0 or later is not installed, follow the instructions below.

Solution Install DirectX version 5.0 or later. To install DirectX 5.0:

- 1 Insert the “Matrox Installation” CD-ROM in your CD-ROM drive. Windows automatically starts the CD-ROM setup program; click **Cancel** to continue.
- 2 Click  **Start** → **Run**.
- 3 Type “d:\directx5\dxsetup”, where “d:\” is the drive letter of your CD-ROM drive; then click **OK** to start the DirectX setup program.

Problem: Program for Windows 95 or Windows NT 4.0 doesn't run properly or stops running

Cause Some programs may not work properly with some MGA acceleration.

Solution Disable specific types of software acceleration.

Windows 95:

- 1 Right-click the Windows desktop background, then click the **Properties** menu item → **Settings** tab → **PowerDesk** button → **Performance** tab.
- 2 Clear one or more check boxes, starting with **Use Device Bitmaps Caching**.
For more information, see context-sensitive Help.
- 3 Click **OK** → **Close** to accept the changes. (Depending on the feature you disabled, you may have to restart your computer for the changes to take effect.)

Windows NT 4.0:

- 1 Right-click the Windows desktop background, then click **MGA Display Properties** menu item → **Performance** tab.
- 2 Clear one or more check boxes.
For more information, see context-sensitive Help.
- 3 Click **OK** → **Yes** to accept the changes. (Depending on the feature you disabled, you may have to restart your computer for the changes to take effect.)

Solution If possible, update your Matrox display driver. Matrox makes new display drivers available on the Matrox Web site (www.matrox.com/mga) and BBS (see page 23).

Solution Windows 95: Disable Matrox hardware acceleration.

- 1 Right-click the **My Computer** icon on the Windows desktop background.
- 2 Click the **Properties** menu item → **Performance** tab → **Graphics** button.
- 3 Move the **Hardware acceleration** slider to **None**.
- 4 Click **OK** → **Close** → **Yes** to accept the changes and restart your computer.

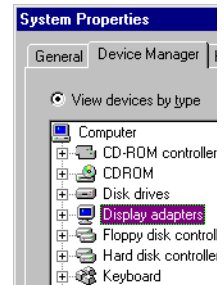
Note: If you identify a program that doesn't work well with MGA acceleration, please contact Matrox technical support (see page 24) and describe the problem. This information may help us come up with a fix or work-around in a future driver release.

Problem: After restarting my computer, Windows 95 warns that the graphics card is not configured correctly

Cause You may have a conflict because of previously installed display drivers.

Solution

- 1 If Windows 95 prompts you to start the **Add New Hardware Wizard**, click **Cancel**. (If you start the Wizard, it will *not* detect your graphics card.)
- 2 Right-click the **My Computer** icon on the Windows 95 desktop.
- 3 Click the **Properties** menu item → **Device Manager** tab.
- 4 Click the plus sign next to **Other devices** (if it appears) and **Display adapters**.
- 5 Delete *all* listed display adapters (click each, then click **Remove**), then click **OK**.
- 6 Restart your computer and reinstall the MGA display drivers (see page 6).



Problem: Screen image defects appear in Windows 95 or Windows NT 4.0 (example: mouse pointer not drawn properly)

Cause Some programs may not work properly with some MGA acceleration.

Solution Disable specific types of software acceleration.

Windows 95:

- 1 Right-click the Windows desktop background, then click the **Properties** menu item → **Settings** tab → **PowerDesk** button → **Performance** tab.
- 2 Clear one or more check boxes, starting with **Use Device Bitmaps Caching**.
For more information, see context-sensitive Help.
- 3 Click **OK** → **Close** to accept the changes. (Depending on the feature you disabled, you may have to restart your computer for the changes to take effect.)

Windows NT 4.0:

- 1 Right-click the Windows desktop background, then click **MGA Display Properties** menu item → **Performance** tab.
- 2 Clear one or more check boxes.
For more information, see context-sensitive Help.
- 3 Click **OK** → **Yes** to accept the changes. (Depending on the feature you disabled, you may have to restart your computer for the changes to take effect.)

Solution If possible, update your Matrox display driver. Matrox makes new display drivers available on the Matrox Web site (www.matrox.com/mga) and BBS (see page 23).

Solution Windows 95: Disable Matrox hardware acceleration.

- 1 Right-click the **My Computer** icon on the Windows desktop background.
- 2 Click the **Properties** menu item → **Performance** tab → **Graphics** button.
- 3 Move the **Hardware acceleration** slider to **None**.
- 4 Click **OK** → **Close** → **Yes** to accept the changes and restart your computer.

Cause Windows 95: There may be a conflict between resources in your system.

Solution

- 1 Right-click the **My Computer** icon on the Windows desktop background, then click the **Properties** menu item → **Device Manager** tab.
- 2 Click the plus sign next to **Other devices** (if it appears) and **Display adapters**.
- 3 Delete any display adapter *other than* the one for your Matrox graphics card.
- 4 Restart your computer.

Display information

Refresh rates

| Display resolution* | Horizontal refresh rate (kHz) | | | Vertical refresh rate (Hz) | | |
|---------------------|-------------------------------|-------------|---------------|----------------------------|-------------|---------------|
| | Mystique 220 | G100 series | Millennium II | Mystique 220 | G100 series | Millennium II |
| 640 × 480 | 31–102 | 31–102 | 31–102 | 60–200 | 60–200 | 60–200 |
| 800 × 600 | 31–114 | 38–114 | 38–114 | 60–200 | 60–200 | 60–200 |
| 1024 × 768 | 48–113 | 48–113 | 48–113 | 60–140 | 60–140 | 60–140 |
| 1152 × 864 | 54–110 | 54–110 | 54–110 | 60–120 | 60–120 | 60–120 |
| 1280 × 1024 | 64–107 | 64–107 | 64–107 | 60–100 | 60–100 | 60–100 |
| 1600 × 1200 | 75–100 | 75–106 | 75–113 | 60–80 | 60–85 | 60–90 |
| 1920 × 1080 | 68–84 | 68–88 | 70–94 | 60–72 | 60–75 | 60–80 |
| 1920 × 1200 | 75–81 | 75–88 | 75–95 | 60–65 | 60–70 | 60–76 |
| 1800 × 1440 | 89 | 89–96 | 89–104 | 60 | 60–65 | 60–70 |

* Maximum refresh rates are attainable when using 8- or 16-bit color palettes.

Maximums may not be attainable at the highest display resolutions **with** a 24- or 32-bit color palette.

Maximum display resolutions – Matrox Mystique 220 & G100 series

| Graphics memory | Color palette | Maximum display area | Maximum 3D display area* |
|-----------------|----------------------------|---------------------------|--------------------------|
| 2 MB | 256 colors (8-bit) | 1920 × 1080 | — |
| | 32/64 K colors (15/16-bit) | 1152 × 864 | 800 × 600 |
| | 16.8 M colors (24-bit) | 800 × 600 | — |
| | 16.8 M colors (32-bit) | 800 × 600 | — |
| 4 MB | 256 colors (8-bit) | 1800 × 1440 / 1920 × 1200 | — |
| | 32/64 K colors (15/16-bit) | 1920 × 1080 | 1152 × 864 |
| | 16.8 M colors (24-bit) | 1280 × 1024 | — |
| | 16.8 M colors (32-bit) | 1152 × 864 | 800 × 600 |
| 8 MB | 256 colors (8-bit) | 1800 × 1440 / 1920 × 1200 | — |
| | 32/64 K colors (15/16-bit) | 1800 × 1440 / 1920 × 1200 | 1920 × 1080 |
| | 16.8 M colors (24-bit) | 1920 × 1080 | — |
| | 16.8 M colors (32-bit) | 1280 × 1024 | 1152 × 864 |

* Double-buffering, without Z-buffering.

Maximum display resolutions – Matrox Millennium II

| Graphics memory | Color palette | Maximum display area | Maximum 3D display area* |
|-----------------|----------------------------|---------------------------|---------------------------|
| 4 MB | 256 colors (8-bit) | 1800 × 1440 / 1920 × 1200 | — |
| | 32/64 K colors (15/16-bit) | 1920 × 1080 | 1152 × 864 |
| | 16.8 M colors (24-bit) | 1280 × 1024 | — |
| | 16.8 M colors (32-bit) | 1152 × 864 | 800 × 600 |
| 8 MB | 256 colors (8-bit) | 1800 × 1440 / 1920 × 1200 | — |
| | 32/64 K colors (15/16-bit) | 1800 × 1440 / 1920 × 1200 | 1920 × 1080 |
| | 16.8 M colors (24-bit) | 1920 × 1080 | — |
| | 16.8 M colors (32-bit) | 1280 × 1024 | 1152 × 864 |
| 12 MB | 256 colors (8-bit) | 1800 × 1440 / 1920 × 1200 | — |
| | 32/64 K colors (15/16-bit) | 1800 × 1440 / 1920 × 1200 | 1800 × 1440 / 1920 × 1200 |
| | 16.8 M colors (24-bit) | 1920 × 1080 | — |
| | 16.8 M colors (32-bit) | 1280 × 1024 | 1280 × 1024 |
| 16 MB | 256 colors (8-bit) | 1800 × 1440 / 1920 × 1200 | — |
| | 32/64 K colors (15/16-bit) | 1800 × 1440 / 1920 × 1200 | 1800 × 1440 / 1920 × 1200 |
| | 16.8 M colors (24-bit) | 1920 × 1080 | — |
| | 16.8 M colors (32-bit) | 1280 × 1024 | 1280 × 1024 |

* Double-buffering, without Z-buffering.

Supported VESA modes

In the table below, VESA modes supported by your Matrox graphics card are indicated by a VESA mode number. Many Super VGA DOS programs use VESA modes.

| Display resolution | 16 colors | 256 colors | 32 K colors | 64 K colors | 16.8 M colors |
|--------------------|-----------|------------|-------------|-------------|---------------|
| 640 × 400 | — | 100 | — | — | — |
| 640 × 480 | — | 101 | 110 | 111 | 112 |
| 800 × 600 | 102 | 103 | 113 | 114 | 115 |
| 1024 × 768 | — | 105 | 116 | 117 | 118 |
| 1280 × 1024 | — | 107 | 119 | 11A | — |
| 1600 × 1200 | — | 11C | 11D | 11E | — |

Hardware information

Matrox G100 series

- MGA-G100 graphics chip, 230 MHz internal RAMDAC
- Graphics cards –
 - G100A/2B series: AGP Bus, 2 MB SGRAM *
 - G100A/4B series: AGP Bus, 4 MB SGRAM *
 - G100P/2B series: PCI Bus, 2 MB SGRAM *
 - G100P/4B series: PCI Bus, 4 MB SGRAM *

Matrox Millennium II

- MGA-2164W graphics chip, 250 MHz TI 3026 external RAMDAC
- Graphics cards –
 - MIL2A/4 series: AGP Bus, 4 MB WRAM
 - MIL2A/8 series: AGP Bus, 8 MB WRAM
 - MIL2P/4 series: PCI Bus, 4 MB WRAM
 - MIL2P/8 series: PCI Bus, 8 MB WRAM
- Memory upgrades † –
 - MIL2/MOD4: 4 MB WRAM (for MIL2A/2, MIL2A/4, MIL2P/4 and MIL2P/8)
 - MIL2/MOD8: 8 MB WRAM (for MIL2A/2, MIL2A/4, MIL2P/4 and MIL2P/8)
 - MIL2/MOD12: 12 MB WRAM (for MIL2A/4 and MIL2P/4)

Matrox Mystique 220

- MGA-1164SG graphics chip, 220 MHz internal RAMDAC
- Graphics cards –
 - MY220P/2 series: 2 MB SGRAM
 - MY220P/4 series: 4 MB SGRAM
 - MY220P/BIZ2 series: 2 MB SGRAM
 - MY220P/BIZ4 series: 4 MB SGRAM
- Memory upgrades † –
 - MYST/MOD2: 2 MB SGRAM (for MY220P/2 and /BIZ2)
 - MYST/MOD4: 4 MB SGRAM (for MY220P/4 and /BIZ4)
 - MYST/MOD6: 6 MB SGRAM (for MY220P/2 and /BIZ2)

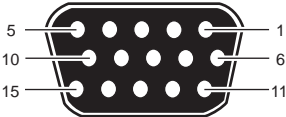
* The G100A/2B, G100A/4B, G100P/2B and G100P/4B series of graphics cards are not upgradeable with graphics memory modules or multi-media add-ons.

† The Matrox Rainbow Runner Studio video capture add-on card (sold separately) can't be used at the same time as a memory module. This is because they each attach to the same connectors on the graphics card.

Matrox G100 series, Millennium II & Mystique 220

- Technical features –
 - 64-bit VGA-compatible drawing engine
 - Separate sync monitors only
 - Matrox PCI card only: Supports PCI bus version 2.1 at clock speeds up to 33 MHz
 - Matrox AGP card only: Supports AGP bus version 1.0 at 66 MHz
- Video specifications –
 - The video follows the PS/2 standard, with no sync on RGB, and no blanking pedestal. Black or blank – 0.0 V; White – 0.700 V.
 - There are five connections to a monitor that uses BNC (Bayonet Nut Connect) connectors – R, G, B, HSYNC (white or gray wire), and VSYNC (black wire).
- Environmental specifications –
 - Minimum/maximum ambient operating temperatures: 0 to 55° C
 - Minimum/maximum storage temperature: -40 to 75° C
 - Maximum altitude for operation: 3,000 meters
 - Maximum altitude for transport: 12,000 meters
 - Operating humidity: 20 to 80% relative humidity (non-condensing)
 - Storage humidity: 5 to 95% relative humidity (non-condensing)

Monitor connector pinouts

| | | | | |
|---|-----|---------------------|----|---------------------|
|  | 1 | Analog red output | 10 | Ground |
| | 2 | Analog green output | 11 | Not connected |
| | 3 | Analog blue output | 12 | SDA (DDC) |
| | 4 | Not connected | 13 | TTL horizontal sync |
| | 5-8 | Ground | 14 | TTL vertical sync |
| | 9 | +5 V (DDC) | 15 | SCL (DDC) |
| | | | | |
| | | | | |
| | | | | |

Customer support

Matrox Web and FTP sites

Matrox is on the Internet with a World Wide Web (WWW) and File Transfer Protocol (FTP) site. Our Web site has product literature, press releases, technical material, a sales office list, trade show information, and other relevant material. Our FTP site contains current drivers for Matrox products. You can download drivers using the Internet FTP site, in addition to our BBS. You can access our FTP server independently, or from the Matrox Web site.

Our address for Matrox Graphics Inc. is:

WWW; www.matrox.com/mga
FTP; [ftp.matrox.com/pub/mga/](ftp://ftp.matrox.com/pub/mga/)

Send questions or comments regarding the site to:

e-mail; webmaster@matrox.com

If you have a problem

If you have a problem, we recommend that you follow the procedure below for the quickest results.

- 1 Contact your dealer** – This is usually the quickest and most effective method of technical assistance. Your dealer is local and may be familiar with your complete system. In the case of hardware warranty assistance, the product must be returned to the dealer, who will return it to Matrox.
- 2 CompuServe** – If you have a modem and an account on CompuServe, you can get technical assistance and driver updates directly from Matrox by typing *GO MATROX* at the “!” prompt.
- 3 Matrox BBS** – You can download driver updates (which may eliminate a particular bug), utilities, and other information from our 24-hour Bulletin Board Service (BBS). The phone number is **514-685-6008**. The communication parameters are 8 data bits, 1 stop bit, and no parity. You’ll be prompted to enter your first and last name and a password. If you don’t have an account, it’s created when you enter your name for the first time. *See also “Matrox Web and FTP sites”.*
- 4 MATFAX instant fax** – Call our dial-up Matrox fax service at **514-685-0174**. Using a touch tone phone, you can have faxes sent to you automatically 24 hours a day. Available documents include common installation problems, available drivers and updates, and product data sheets.

5 Direct Matrox Technical Assistance – If you still can't resolve a problem, you can get direct technical assistance four ways:

- Call Technical Support (Canada) at **514-685-0270**. For residents of Quebec only, call **514-969-6330**.
- Send a FAX to **514-969-6363**, Att: Graphics Technical Assistance.
- Send e-mail to *graphics.techsupport@matrox.com*.
- Write a letter to Graphics Customer Support at our Corporate Headquarters. The address is: **Matrox Graphics Inc., 1025 St. Regis Blvd., Dorval, QC, Canada, H9P 2T4**.

Information we need

Please give a complete description of the problem, and include:


- Matrox card serial number, model number, revision number, BIOS number, driver type and version, and memory address at which the Matrox card is installed.
- Computer brand name, system BIOS manufacturer and version number or date, bus type, model, processor speed, and amount of memory.
- Monitor brand and model name.
- Operating system and version – if you're using a memory manager, its brand and version. Also, list any memory-resident programs in use.
- If you're using a network, its brand and version.
- Brand and model of any other cards and devices installed on your system.

Program Specific Problems

If a problem appears with a specific program, please give us the following information:

- Display settings (color palette, display resolution, and so on) applied when the problem occurs.
- Program name and version. Name any add-on packages you're using.
- If possible, take note of the file and segment address that caused the problem.
- Detailed steps known to cause the bug, so we can reproduce it.

Where to get information

- For display information, right-click the Windows desktop background, then:
 - **Windows 95** – click **Properties** → **Information**.
 - **Windows NT 4.0** – click **MGA Display Properties** → **Information**.
- For system information:
 - **Windows 95** – right-click the **My Computer** icon on your Windows desktop background, then click **Properties**.
 - **Windows NT** – click  → **Administrative Tools (Common)** → **Windows NT Diagnostics**.

Free CompuServe introductory membership offer

As a Matrox customer, you are entitled to a free Introductory Membership to CompuServe including:

- Free access to CompuServe's Basic Services for one month
- \$15 introductory usage credit to explore the Matrox section on the Graphics B Vendor Forum and CompuServe's other Extended and Premium service offerings
- A personal User ID Number and Password
- A complimentary subscription to CompuServe's monthly magazine, *CompuServe Magazine*

To receive your free CompuServe introductory membership

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 - In Germany, call **0130 37 32**.
 - In the rest of Europe, call **44 117 976 0681**.
 - Outside of the U.S., Canada, and Europe, call **614-529-1349**.

Contact Matrox on CompuServe to receive answers to questions you may have about our graphics accelerators and video products. You can receive:

- Assistance on technical questions
- Information on the latest products and upgrades
- Tips on using Matrox products

Through CompuServe, you can directly contact Matrox technical representatives or other Matrox users. You can also take advantage of the many services CompuServe offers.

Warranty

Matrox hardware products are warranted against defects in materials and workmanship for a period of *three years* from the date of delivery. We will repair or replace products which prove to be defective during the warranty period provided they are returned, through your dealer, to Matrox Graphics Inc. No other warranty is expressed or implied. Matrox is not liable for consequential damages.

If you experience difficulties with your Matrox product, please contact the dealer where you purchased the product for service. Do not return any product to Matrox without authorization.

Procedure to follow

- 1** Verify that your Matrox card was installed and configured according to the information in this guide.
- 2** Read the “Troubleshooting” section to see if you can solve the problem yourself. This is the quickest and easiest solution to attempt.
- 3** Contact the dealer where you purchased your Matrox card for additional help. If for some reason you can’t reach a Matrox dealer, contact our Customer Support group at **514-685-0270**. For residents of Quebec only, call **514-969-6330**.

Returning a Matrox card

If you must return a Matrox card, leave the configuration as it was when you were using it. Pack the product in its original box and bring it in to your dealer who will return it to Matrox for you.

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2. The Software is properly recorded upon the CD/disks included.
3. The documentation is substantially complete and contains all the information Matrox deems necessary to use the software.
4. The Software functions substantially as described in the documentation.

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Excerpt of

**EtherLink® XL PCI 10 Mbps
Network Interface Cards
User Guide**

**Member of the 3Com EtherLink XL family of
network interface cards**

**only hardware and software
installation**

1

INSTALLING THE NETWORK INTERFACE CARD

This chapter describes the 3Com® EtherLink® XL PCI 10 Mbps 3C900B network interface cards (NICs). Procedures are provided for installing the NIC hardware and software and connecting each version of the NIC to an Ethernet network.

Figure 1-1 shows the two versions of the 3C900B NIC. These NICs connect your PC to a 10 Mbps Ethernet network using up to three different types of media.

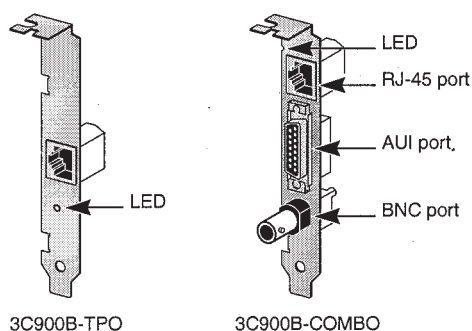


Figure 1-1 3C900B Network Interface Cards

Table 1-1 shows the cable, connector, transceiver, and maximum network segments for the various 3C900B NIC models.

Table 1-1 3C900B NIC Models

| NIC Model | Cable | Connector | Transceiver | Maximum Network Segment |
|--------------|--|------------|-------------|-------------------------|
| 3C900B-TPO | Category 3, 4, or 5 unshielded twisted-pair (10BASE-T) | RJ-45 | On-board | 328 ft/100 m |
| 3C900B-COMBO | Category 3, 4, or 5 unshielded twisted-pair (10BASE-T) | RJ-45 | On-board | 328 ft/100 m |
| | 10BASE5 thick Ethernet coaxial | 15-pin AUI | External | 1640 ft/500 m |
| | 10BASE2 thin Ethernet coaxial | BNC | On-board | 1000 ft/305 m |

Preparing for Installation

Before you install the 3C900B NIC, verify that you have all of the components. If any of these items are damaged or missing, contact your shipper or network supplier.

- EtherLink XL PCI NIC (3C900B)
- *EtherLink XL PCI Network Interface Cards User Guide* (this guide)
- 3Com 3C900B *EtherDisk* diskettes 1 and 2

You also need to know the following about your network environment:

- The kind of network cabling that is used to connect to the network at your site. You must use the same kind of network cable. The NIC that you install in your PC must have a port that matches the connector on the network cable that you use.
- Your network protocol (IPX, NetBEUI, or TCP/IP).

The next step is to install the NIC in the PC.

Inserting the NIC

The following instructions apply to installing the 3C900B NIC in most PCs. If these instructions are not appropriate for your PC, refer to the documentation that accompanied your PC.



CAUTION: Each NIC is packed in antistatic packaging to protect it during shipment. Before handling the NIC, touch the bare metal case of your PC. While you are handling the NIC, wear a wrist strap grounded to the PC chassis.

Remove all jewelry from your hands and wrists and use only insulated or nonconducting tools.

Follow these steps to install the NIC in your PC:

- 1 Turn the power off, and remove the power cord from the PC.**
- 2 Unscrew the cover screws and remove the cover.**

On some PCs, it may be necessary to remove all cables before the cover can be removed.
- 3 Locate an available bus-mastering PCI slot and remove the screw from the corresponding backplate (Figure 1-2). Save the screw.**



Early PCI PCs that have more than one PCI slot typically have only one bus-mastering PCI slot. In this case, the correct PCI slot to use is usually the one closest to the power supply in the PC. However, you should consult your PC documentation to verify this. In newer PCI systems, all PCI slots are bus-mastering slots.

Many PCs have both ISA and PCI slots. Make sure that you install the NIC only in a bus-mastering PCI slot. See Figure 1-2. PCI slots are usually white, and they are shorter than ISA slots.

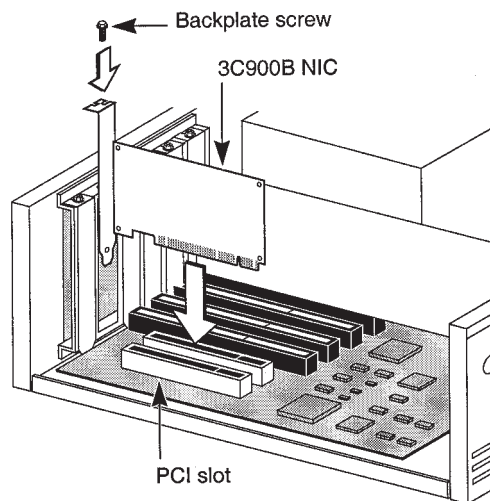


Figure 1-2 Installing the 3C900B NIC

- 4 Remove and discard the backplate.**
- 5 Ensure that the shape and length of the edge connector on the NIC match the slot that you intend to use (Figure 1-2).**
- 6 Carefully insert the NIC into the slot. Press firmly with steady pressure to ensure that the NIC is fully seated in the slot.**

When the NIC is correctly inserted in the slot, the NIC backplate is flush with the PC backplane.
- 7 Secure the NIC with the backplate screw.**
- 8 Replace the PC cover. Reinsert and tighten the cover screws.**
- 9 Reconnect all power and peripheral cables.**

Connecting to the Network

This section describes how to connect the 3C900B NIC to an Ethernet network using an RJ-45, BNC, or AUI port. Each 3C900B NIC provides different network ports, as shown in Figure 1-1. Follow the procedure for the network port on the NIC that you install.



When you first install the NIC and power on the PC, the LED on the NIC backplate lights, but the link is not active. To enable the link, you must load the network drivers. See "Interpreting the Link LED" at the end of this chapter for more information.

RJ-45 Port

Follow these steps to connect the RJ-45 port on the 3C900B-TPO and COMBO NICs to the network:

- 1 Plug the RJ-45 connector on the twisted-pair network cable into the RJ-45 port on the NIC backplate. See Figure 1-3.**

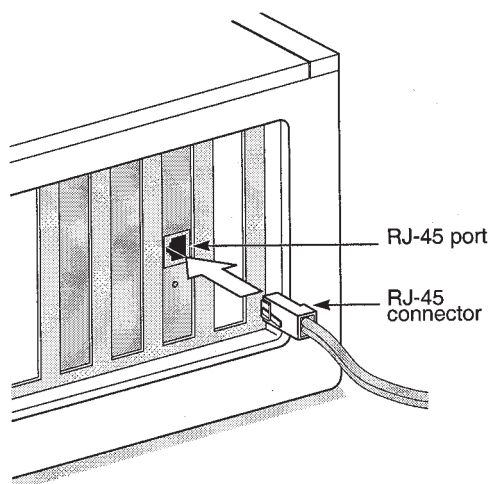


Figure 1-3 Connecting to the RJ-45 Port on the 3C900B NIC

- 2 Connect the other end of the network cable to an active network port.**

Go to "Interpreting the Link LED" later in this chapter.

BNC Port

Follow these steps to connect the BNC port on the COMBO NIC to the network:

- 1 **Connect the BNC connector on the thin Ethernet coaxial cable to the BNC port on the NIC. See Figure 1-4.**

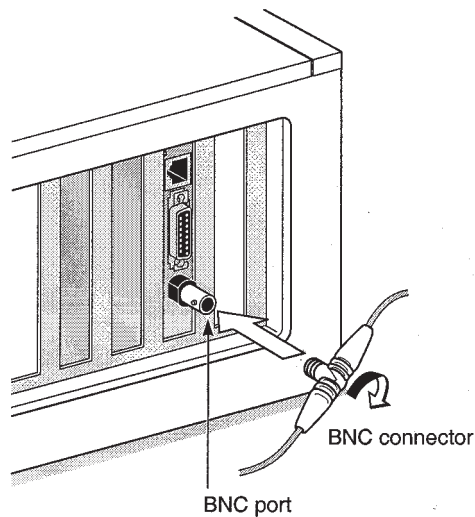


Figure 1-4 Connecting to the BNC Port on the 3C900B-COMBO NIC

- 2 **Connect the other end of the network cable to another PC or a 50-ohm terminator.**



If your PC is the last physical device in the network daisy chain, you must connect a 50-ohm terminator to the other end of the BNC T-connector.

The next step is to install the network driver. Go to the next chapter.

AUI Port

Follow these steps to connect the AUI port (Figure 1-5) on the 3C900B COMBO NIC to the network:

- 1 Locate the 15-pin AUI port on the NIC and move the slide latch down to the open position.**

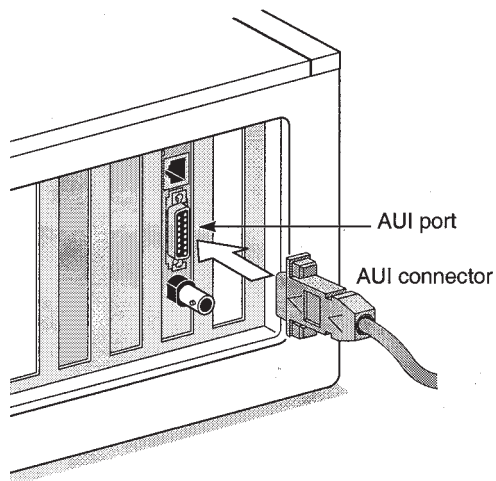


Figure 1-5 Connecting to the AUI Port on the 3C900B-COMBO NIC

- 2 Connect the thick Ethernet coaxial cable to the AUI port on the NIC.**
This connector attaches in only one way. Orient the AUI connector to match the AUI port on the NIC.
- 3 Move the slide latch up to the closed position to lock the AUI connector in place.**
- 4 Connect the other end of the network cable to an external transceiver.**

The next step is to install the network driver. Go to the next chapter.

Interpreting the Link LED

The 3C900B NICs have one light-emitting diode (LED). When the LED is on (but before the driver is loaded), the LED indicates that the NIC is receiving power.

Other than indicating that the NIC is receiving power, the LED serves no other purpose for either an AUI or a BNC media connection. Table 1-2 explains the LED states for 3C900B NICs.

Table 1-2 LED Interpretation

| LED State | Meaning | Connector | | |
|-----------|---|-----------|-----|-----|
| | | RJ-45 | AUI | BNC |
| On | If drivers are installed, the connection is active. | Yes | N/A | N/A |
| | If drivers are not installed, the NIC is receiving power. | Yes | Yes | Yes |
| Off | Something is preventing the connection between the NIC and the hub. | Yes | N/A | N/A |
| Blinking | The cable polarity is reversed. Try a different network cable or contact your MIS representative. | Yes | N/A | N/A |

If the NIC LED indicates a problem, check the following:

- 1 Ensure that your network hub and the network cable connecting to your 3C900B NIC comply with the 10BASE-T specifications.**
- 2 Ensure that the hub is powered on.**

You have completed the hardware installation.

The next step is to install the network driver. Go to the next chapter.

2

INSTALLING THE NETWORK DRIVER

This chapter describes how to install the network driver that allows the 3C900B NIC to transmit and receive data over an Ethernet network.

To obtain the latest shipping version of a network driver, go to the 3Com World Wide Web site:

<http://www.3com.com/>



Before attempting to install a network driver, ask your network administrator which driver to install.

Go to the appropriate section in this chapter for the procedure describing how to install the driver for the network used at your site.

Windows 95

This section describes how to install the 32-bit protected-mode driver in a PC running Microsoft Windows 95. This driver can be used in both Microsoft and NetWare environments, and it supports dRMON and PACE™ technology.



Do not use the AutoLink software to install the network driver under Windows 95. To install the network driver under Windows 95, you need the Windows 95 installation files. These files may be on a CD or standard diskettes, or they may have been copied to your hard disk when Windows 95 was installed on your system.

The version of Windows 95 installed on your PC determines which of the following driver installation procedures to use.

Follow these steps to determine the Windows 95 version installed on your PC:

1 Right-click the My Computer icon and click *Properties*.

The System Properties window is displayed.

2 Check the version number on the General screen, under System:

- If 4.00.950 is displayed, follow the procedure for Windows 95 Build 950.
- If 4.00.950B is displayed, follow the procedure for Windows 95 OSR2.

Windows 95 Build 950

Follow these steps to install the network driver in a PC running the Build 950 version of Windows 95:

1 Install the NIC, connect to the network, and turn the power on.

Windows 95 detects the NIC and displays the New Hardware Found dialog box, prompting you for the driver you want to install for your new hardware.

2 Select *Driver from disk provided by hardware manufacturer*, and then click *OK*.

The Install from Disk dialog box is displayed.

3 Insert *EtherDisk* diskette 2 in drive A and enter the path to drive A if it is not already displayed.

4 Click *OK*.

- If this is the first time that networking is being installed on your PC, the Identification tab of the Network window is displayed. Go to step 5.
- If networking has already been installed, you are prompted for the Windows 95 CD. In this case, go to step 7.

5 In the specified fields of the Identification tab screen, enter:

- The name of your computer
Give your PC a unique name of up to 15 characters. Spaces are not allowed; however, you can use hyphens.

- Your workgroup name

A workgroup (for example, your department name) is composed of the PCs you usually communicate with and the workgroup's shared resources (for example, printers).

If you use peer-group networking, the workgroup name is your peer group. Peers can see each other when they look in the Network Neighborhood.

For information on peer-to-peer networking, see the W95NDIS.TXT file in the HELP directory on *EtherDisk* diskette 1.

- A description of your computer

Filling in this field is optional. The information that you enter in this field is visible to others when they view your computer on the network. The description should help others to know the function or use of your PC.

6 Click Close.

Files are copied and you are prompted for the Windows 95 CD.

7 Click OK.

The Copying Files dialog box is displayed.

8 Remove *EtherDisk* diskette 2 from drive A.

9 If not already displayed, enter the path to the CD-ROM drive, insert the Windows 95 CD in the CD-ROM drive, and click OK.

Files are copied, and you are then prompted to restart your computer.

10 Click Yes.

Windows prompts you to enter your name and network password.

11 Enter your user name and password, and then click OK.

To confirm successful installation, go to "Confirming Installation" later in this chapter.

Windows 95 OSR2

Follow these steps to install the network driver in a PC running the OSR2 version of Windows 95:

1 Install the NIC, connect to the network, and turn the power on.

Windows 95 detects the NIC. The Update Device Driver Wizard starts and prompts you for a diskette or CD.

2 Insert *EtherDisk* diskette 2 in drive A and click *Next*.

Windows finds the driver and asks if you want to use this driver.

3 Click *Finish*.

The Insert Disk dialog box prompts you for *EtherDisk* diskette 2.

4 Click *OK*.

The Copying Files dialog box is displayed.

5 If not already displayed, enter the path to drive A.

6 Click *OK*.

- If this is the first time that networking is being installed on your PC, the Identification tab of the Network window is displayed. Go to step 7.
- If networking has already been installed, you are prompted for the Windows 95 CD. In this case, go to step 9.

7 In the specified fields of the Identification tab screen, enter:

- The name of your computer
Give your PC a unique name of up to 15 characters. Spaces are not allowed; however, you can use hyphens.
- Your workgroup name
A workgroup (for example, your department name) is composed of the PCs you usually communicate with and the workgroup's shared resources (for example, printers).

If you use peer-group networking, the workgroup name is your peer group. Peers can see each other when they look in the Network Neighborhood.

For information on peer-to-peer networking, see the W95NDIS.TXT file in the HELP directory on *EtherDisk* diskette 1.

- A description of your computer

Filling in this field is optional. The information that you enter in this field is visible to others when they view your computer on the network. The description should help others to know the function or use of your PC.

8 Click *Close*.

Once the installation files are copied to your hard disk, Windows prompts you for the Windows 95 CD.

9 Click *OK*.

10 Remove *EtherDisk* diskette 2 from drive A and click *OK*.

The Copying Files dialog box is displayed.

11 If not already displayed, enter the path to the CD-ROM drive, insert the Windows 95 CD in the CD-ROM drive, and click *OK*.

Windows 95 prompts you to reboot.

12 Click *Yes*.

Windows prompts you for your user name and password.

13 Enter your user name and password, and then click *OK*.

To confirm successful installation, go to the next section.

Confirming Installation

Follow these steps to confirm that the NIC is installed and functioning correctly:

- 1 **Right-click the My Computer icon, click *Properties*, and then click the Device Manager tab.**

A list of devices appears, arranged by type.

- 2 **Double-click *Network adapters*.**

The name of the installed NIC appears:

3Com EtherLink XL xxx 10 Mb Ethernet NIC
(3C900B-xxx)

where xxx represents the NIC model installed in your PC, for example, TPO.

If a yellow exclamation point (!) or a red X appears next to the NIC name, go to "Frequently Asked Questions" in Chapter 3 to troubleshoot the NIC.

- 3 **Double-click the name of the NIC to display a description of the NIC and its current status.**

The message in the Device status panel confirms that the 3C900B NIC is working properly.

- 4 **Click *Cancel* to close each dialog box. Then close the Control Panel and My Computer windows.**

You have successfully installed and configured the 3C900B NIC.

Windows NT

This section describes how to install the network driver in a PC running Microsoft Windows NT 4.0 or 3.51.



Do not use the AutoLink software to install the network driver under Windows NT.

If Windows networking is not installed on your PC, you may also need the following information from your network administrator:

- Whether you are on a LAN or are connecting to one through a modem
- The protocol used in the Microsoft Windows network (typically TCP/IP or NetBEUI)

- The name of the Windows NT server domain or workgroup that you belong to
- The IP address that you will use if your network does not have a DHCP server (TCP/IP only)

Windows NT 4.0

Follow these steps to install the network driver in a PC running Windows NT 4.0:

- 1 Install the NIC, connect to the network, and turn the power on.**
- 2 Double-click the My Computer icon, double-click the Control Panel icon, and then double-click the Network icon.**

The Network window appears.

- 3 Click the Adapters tab.**

If you are replacing a NIC that was previously installed, follow these steps. Otherwise, go to step 4.

- a** Select the existing NIC (that is being replaced) in the Installed Adapters group.
- b** Click *Remove*.
- c** Click Yes in the Warning dialog box.
- d** Reboot the PC and repeat step 2.

- 4 Click Add.**

The Select Network Adapter dialog box appears.

- 5 Click Have Disk.**

- 6 Insert *EtherDisk* diskette 2 in drive A, enter the path to drive A if it is not already displayed, and click OK.**

The OEM Option dialog box appears.

- 7 If not already selected, select *3Com Fast EtherLink/EtherLink XL PCI Busmaster NIC*, and click OK.**

Windows copies files, and then the Setup Message dialog box confirms that 3Com dRMON SmartAgent® software has been successfully installed.

8 Click *OK*.

The 3Com NIC Diagnostics window appears, confirming successful driver installation.

9 Click *Close*.

The Network window appears, displaying the name of the installed NIC.

10 Click *Close*.

If you are prompted for network information, enter the information supplied by your MIS department.
Windows prompts you to restart your computer.

11 Click *Yes*.

The driver installation is complete.

To confirm successful installation, double-click the Network icon in the Control Panel. Click the Adapters tab. The 3C900B NIC should appear on the list. If it is not on the list, see Chapter 3 for troubleshooting information.

Windows NT 3.51

Follow these steps to install the network driver in a PC running Windows NT 3.51:

1 Install the NIC, connect to the network, and turn the power on.**2 In the Main window of the Program Manager, double-click the Control Panel icon and then double-click the Network icon.**

The Network Settings window appears.

If you are replacing a NIC that was previously installed, follow these steps. Otherwise, go to step 3:

- a** Select the existing NIC in the Installed Adapters Cards group.
- b** Click *Remove*.
- c** Click *Yes* in the confirmation window.

d Click *OK* in the Network Settings window and then click *Restart Now*.

e After rebooting, repeat step 2.

3 Click *Add Adapter*.

The Add Network Adapter window appears.

4 Click the down arrow to expand the list box, select *<Other> Requires disk from manufacturer*, and then click *Continue*.

The Select OEM Option dialog box appears with the name of the NIC displayed and selected.

5 Click *OK*.

Windows copies files, and then the Setup Message dialog box confirms that 3Com dRMON SmartAgent software has been successfully installed.

6 Click *OK*.

The 3Com NIC Diagnostics window is displayed, confirming successful installation of the Windows driver.

7 Click *Close*.

8 Click *OK* in the Network Settings window.

If you are prompted for network information, contact your network administrator for the requested information and then follow the prompts.

Windows completes the installation and prompts you to restart Windows NT.

9 Click *Restart Now*.

The driver installation is complete. To confirm successful installation, double-click the File Manager icon. The presence of network server names in the File Manager confirms successful installation.

Novell NetWare Client Driver

This section describes how to install the Novell NetWare client driver for a PC running DOS, Windows 3.x, or Windows for Workgroups. You use 3Com AutoLink software to install DOS client software and drivers for Novell NetWare 3.1x or 4.x.



Do not use the AutoLink driver installation software if you are running Windows 95 or Windows NT. See the previous sections in this chapter for procedures to install network drivers under these operating systems.

AutoLink software modifies the CONFIG.SYS and AUTOEXEC.BAT files. It adds several lines to the AUTOEXEC.BAT file and saves the old file as AUTOEXEC.3CM. It also adds lines to the CONFIG.SYS file and saves the old file as CONFIG.3CM.

AutoLink software logs on to the server and updates the client software if your MIS department has already configured a 3Install account on your server.



To use AutoLink software, your PC should have only one 3C900B NIC installed and at least 1 MB of available hard disk space.

Running AutoLink Software

Follow these steps to run AutoLink software to install the DOS client software and drivers for a NetWare network:

- 1 Install the NIC, connect to the network, and reboot using a DOS diskette.**
- 2 Insert *EtherDisk* diskette 1 in drive A.**
- 3 Run the Install program. Enter:**
`a:install`
The main menu is displayed.
- 4 Select *Auto Install and Config for NetWare (AutoLink)* and press Enter.**
- 5 Select *DOS, Windows 3.1x, or Windows for Workgroups 3.11*, and follow the instructions.**

6 When the auto installation process is completed, remove *EtherDisk* diskette 1 and reboot the PC.



If you are running Windows 3.1x, after you connect to the NetWare server, run the INSTALL.EXE program for full Windows support. INSTALL.EXE gives you a full complement of NetWare requester installation files. Contact your network administrator to obtain this NetWare utility.

If problems occur only when you run AutoLink software, display or print the AUTOLINK.LOG file. This file contains a list of all events that occur during the AutoLink installation and configuration process.

- To display the file, enter:
`type autolink.log | more`
- To print the file, enter:
`print autolink.log`

Novell NetWare Server Driver

This section describes how to install the Novell NetWare driver on a Novell server running NetWare 3.12, 4.10, or 4.11. The NetWare 3.11 server is not supported by the 3C900B NIC.

The NWSERVER directory on *EtherDisk* diskette 1 contains the network driver file (3C90X.LAN) to be used for servers running NetWare 3.12, 4.10, and 4.12. The NetWare Loadable Modules (NLMs) are additional files that are required for servers running NetWare 4.10 or 4.11. NLM files are also on *EtherDisk* diskette 1 in the same directory.



Obtain the most current NLMs from Novell.

NetWare 3.12

Follow these steps to install the driver in a NetWare 3.12 server:

- 1 Obtain the MSM31X.NLM, ETHERTSM.NLM, and NBI31X.NLM files from Novell and copy them to the directory on your hard disk where other NLM files are located.**
- 2 Copy the LAN driver file (3C90X.LAN) from *EtherDisk* diskette 1 to the same directory.**

3 Add the following two lines to the AUTOEXEC.NCF file:

```
load C:\NWSERVER\3C90X.LAN slot=<slot>
    NAME=<name> FRAME=<frametype>
bind ipx to <name> net=<number>
```

4 Save and exit the file, and then reboot the server.**NetWare 4.10 and 4.11**

Follow these steps to install the driver in a NetWare 4.10 or 4.11 server:

1 Install the NetWare server software.

The *NIC Selection* menu appears.

2 Press Enter to display a list of NIC drivers.**3 Press Insert to install an unlisted driver.****4 Insert *EtherDisk* diskette 1 in drive A and press Enter.****5 Press Enter after the driver is loaded.****6 Save parameters and continue the installation.****Multiple NICs**

To support more than one NIC in a NetWare server, change the AUTOEXEC.NCF file to the following format:

```
load C:\NWSERVER\3C90X.LAN slot=<slot1>
    NAME=<name1> FRAME=<frametype1>
bind ipx to <name1> net=<net1>
load C:\NWSERVER\3C90X.LAN SLOT=<slot2>
    NAME=<name2> FRAME=<frametype2>
bind ipx to <name2> net=<net2>
```

The values <slot1> and <slot2> are the values of the PCI slots for the 3C900B NIC. You can use the 3Com DOS diagnostic program to verify the PCI slot number that the NIC is installed in. See Figure 2-1.

The values <name1> and <name2> are unique names assigned to each NIC by your network administrator. The values <name1> and <name 2> must be different names.

The frame parameter (frametype1 and frametype2) can be one of the following: Ethernet_802.2, Ethernet_802.3, Ethernet_II, or Ethernet_SNAP. Make sure that the frametype for the server and the workstation is the same.

For example, if the server uses Ethernet_802.2, the workstation must also use Ethernet_802.2.

The values <net1> and <net2> are unique numbers assigned by the network administrator to each NIC. Make sure that <net1> and <net2> are different numbers.

See the appropriate Novell NetWare manuals for further information.

Follow these steps to verify the PCI slot number that the NIC is installed in:

- 1 **Reboot to a DOS prompt.**
- 2 **Insert *EtherDisk* diskette 1 in drive A, change to the A:\> prompt, and enter:**

3c90xcfg.exe

The Selected NIC screen of the Configuration and Diagnostic Program is displayed, as shown in Figure 2-1.

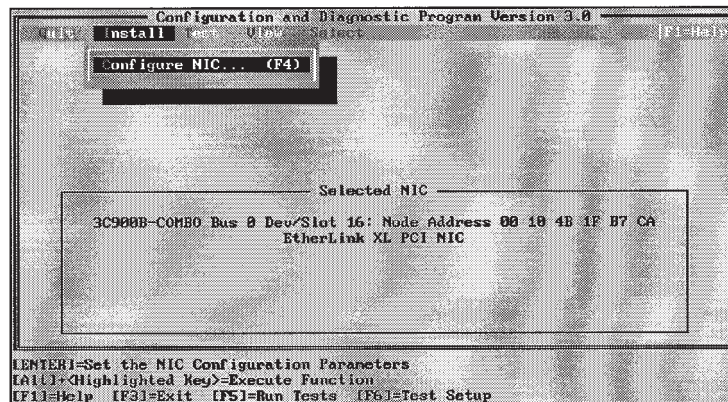


Figure 2-1 Selected NIC Screen of the Configuration and Diagnostic Program

- 3 **Check the slot number in the Selected NIC panel on the screen.**

The slot value that appears in the Selected NIC panel must match the slot value entered in the load line of the AUTOEXEC.NCF file.



Installation Guide

AHA-2910C

PCI-to-Fast SCSI Host Adapter

Adaptec, Inc.
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Milpitas, CA 95035

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Printed in Singapore

Stock No.: 511691-00, Rev. B BKB 11/97



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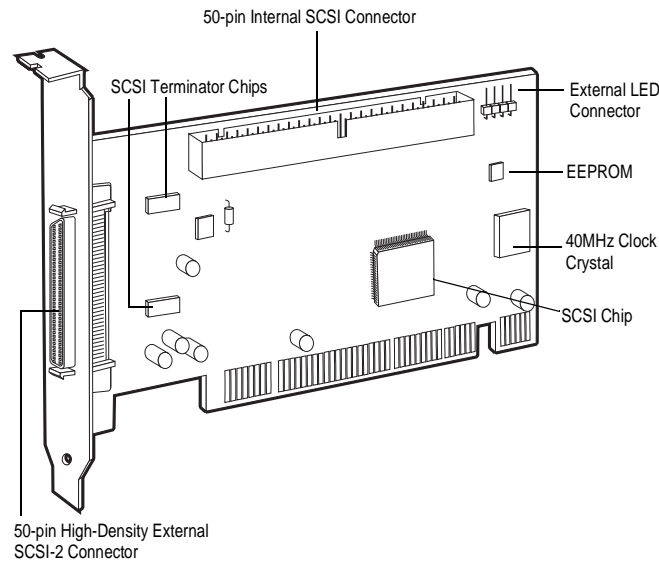
Introduction

This installation guide provides step-by-step instructions on installing your AHA[®]-2910C host adapter. This process involves installing the following hardware and software:

- AHA-2910C host adapter
- Internal SCSI devices
- External SCSI devices
- AHA-2910C software

You will also find helpful hints on configuring your SCSI devices and customizing your host adapter settings with SCSISelect[®].

The AHA-2910C host adapter provides a powerful multitasking interface between your computer's PCI bus and internal and external SCSI devices (disk drives, CD-ROM drives, tape drives, removable-media drives, etc.). The host adapter supports SCSI Configured AutoMatically (SCAM), which automatically assigns SCSI IDs to SCAM compatible devices. The figure below identifies the major components of the AHA-2910C host adapter.



With the Adaptec software drivers, you can use AHA-2910C host adapters in computers running DOS/Windows[®], OS/2, Windows[®] 95, Windows NT[™], UNIX, and NetWare.

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Installation

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| Installing Internal SCSI Devices . . . | 3 |
| Installing External SCSI Devices . . . | 4 |
| Installing AHA-2910C Software . . . | 5 |

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Installation

Installing the Host Adapter

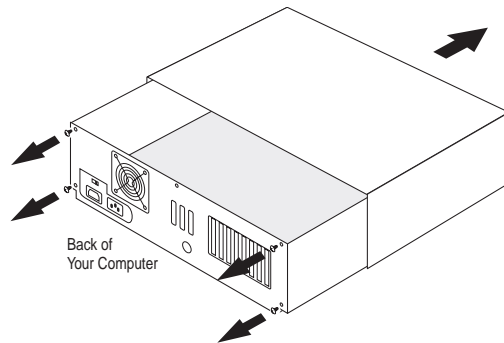
Step 1: Turn OFF your computer and attached devices, and then disconnect the power cords.

Step 2: Touch the metal on the back of your computer with one hand to discharge any static electricity. With your other hand, handle the host adapter by the metal bracket or edges and remove it from the antistatic bag.



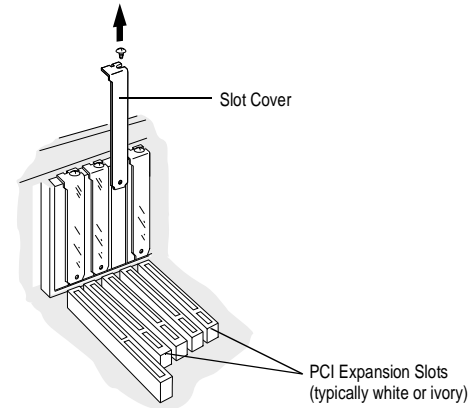
WARNING: Before you go any further, make sure you have completed Steps 1 and 2.

Step 3: Remove the cover from the computer case. (If necessary, refer to your computer documentation.)



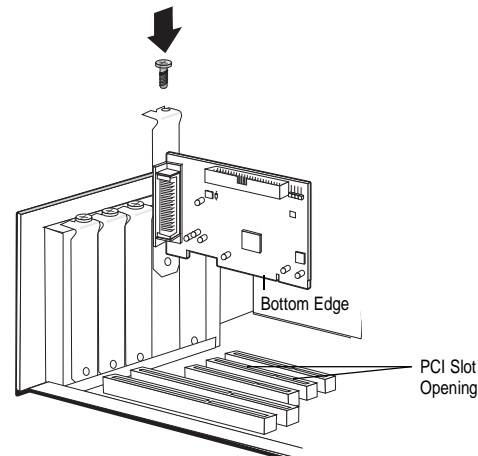
Tip: If you own a computer tower, lay it on its side for an easier installation.

Step 4: Locate an unused PCI expansion slot (typically white or ivory). Unscrew the slot cover and set it aside.

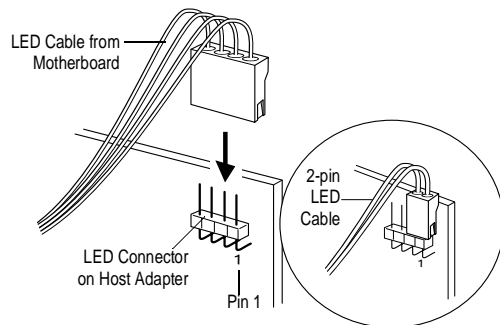


Note: The PCI slot must support 5-volt bus master data transfers. (See your computer documentation or contact your vendor.)

Step 5: Position the host adapter over the PCI slot, and align the bottom edge to the slot's opening. Firmly push the host adapter into the PCI slot, so that it stands perpendicular to the PCI slot.



Step 6: OPTIONAL. If you want the LED in your computer to light whenever there is activity on the SCSI bus, disconnect the LED cable from the LED connector on the motherboard and connect it to the LED connector on the host adapter.



Step 7: Make sure that all your SCSI devices have been set with unique SCSI IDs from 0 to 6. (Refer to your device documentation for SCSI ID settings and instructions on changing the default settings.)



Caution: AHA-2910C host adapters support only *single-ended SCSI* devices. *Differential SCSI* devices may be damaged if you connect them to the host adapter. Read the device documentation.

Installing Internal SCSI Devices

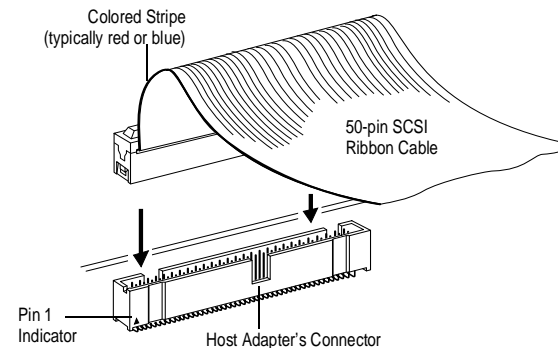
The SCSI devices inside a computer are attached to an internal SCSI cable. The last device on the cable must be terminated. Most internal SCSI devices have a jumper or switch that controls termination. Refer to the device's documentation on enabling or disabling termination.

If you purchased your AHA-2910C as part of an Adaptec kit, you can use the 50-pin internal SCSI cable to connect up to two internal SCSI devices.



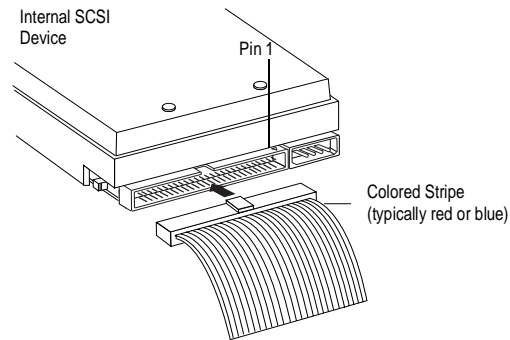
Note: Before you begin, make sure your internal SCSI devices are *not* terminated.

Step 1: Find the colored stripe on the 50-pin internal SCSI cable and then align it with Pin-1 on the host adapter's connector. Pin-1 is usually identified by a ▲, or "1" on the connector.



Step 2: Plug the internal SCSI cable into the host adapter's connector.

Step 3: Align the SCSI cable's colored stripe with Pin-1 on the SCSI device connector, and then plug it in.

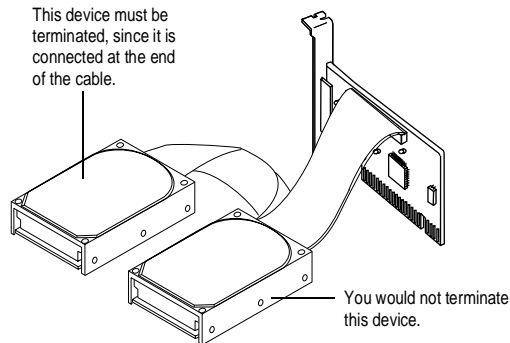


Step 4: Attach the remaining devices using the remaining connectors. These devices should not be terminated.

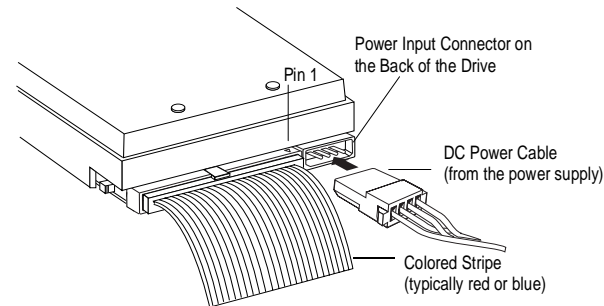
Step 5: Terminate the SCSI device that is attached at the end of the internal SCSI cable.



Caution: If you are attaching an AHA-2910C between *two* terminated SCSI devices, or if you are using both internal and external SCSI devices, you must disable host adapter SCSI termination with *SCSISelect*, (see *Using SCSISelect* on page 7).



Step 6: Connect a DC power cable from your computer's power supply to the power connector on the SCSI device.



Step 7: Replace the computer cover.

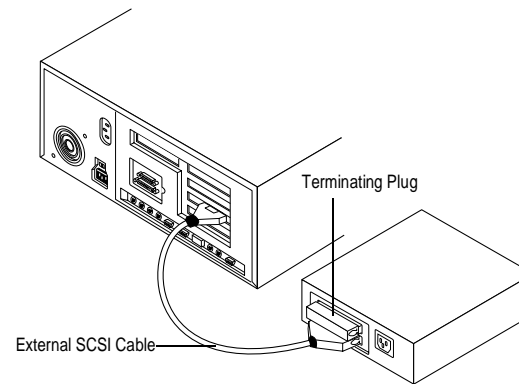
Installing External SCSI Devices

Connecting One Device

Step 1: Plug one end of the 50-pin high-density external SCSI cable into the host adapter's external SCSI connector.

Step 2: Plug the other end of the external SCSI cable into one of the connectors on the external SCSI device.

Step 3: Enable the device termination or attach a terminating plug to the device.



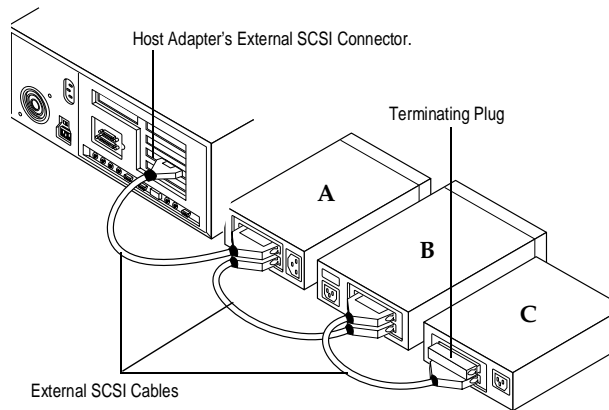
Step 4: Reconnect the power cables to the computer and external SCSI device.

Step 5: Turn ON the external device and computer.

Step 6: Go to *Installing AHA-2910C Software*.

Connecting Two or More Devices

You can connect two or more SCSI devices by creating a "daisy-chain," that is, plugging one device into the next. To do this, make sure you have a 50-pin high-density external SCSI cable for each device.



Step 1: Plug one end of the 50-pin high-density external SCSI cable into the host adapter's external SCSI connector.

Step 2: Plug the other end of the external SCSI cable into one of the connectors on the external SCSI device. (In the figure above, SCSI device A is connected to the host adapter's external SCSI connector.)

Step 3: Take another external SCSI cable and plug it into the next external SCSI device and the one you connected in Step 2. (In the figure above, SCSI device B is connected to SCSI device A.)

Step 4: Connect your remaining devices the same way you connected SCSI devices A and B.

Step 5: On the last device, attach a terminating plug or enable the terminator on the device. (In the figure above, SCSI device C is terminated with a terminating plug.)

Step 6: Reconnect the power cables to the computer and external SCSI devices.

Step 7: Turn ON the external devices and computer.

Step 8: Go to *Installing AHA-2910C Software*.

Installing AHA-2910C Software

Install the appropriate host adapter device driver for your operating system.

- **DOS and Windows 3.x:** DOS and Windows 3.x do not have embedded driver support for your AHA-2910C product, so you must load the drivers yourself. If your host adapter came with Adaptec's EZ-SCSI® software, see the EZ-SCSI software documentation for driver installation instructions.
- **Windows 95:** Windows 95 has embedded driver support for the AHA-2910C. To verify that your AHA-2910C device driver has been properly installed under Windows 95, see *Windows 95 Driver Installation* on page 7.



Note: After installing your AHA-2910C product and restarting Windows 95, you will be prompted through the rest of the installation.

- **Windows NT:** Windows NT 4.0 has embedded driver support for the Adaptec AHA-2910C product. However, earlier versions of Windows NT do not have embedded driver support, so you must load the driver yourself.

If your AHA-2910C came with Adaptec EZ-SCSI software (v4.01 or later), install the Windows NT driver from the diskette provided for your AHA-2910C to support previous versions of Windows NT. (Refer to the Adaptec EZ-SCSI documentation.) Otherwise, if your host adapter came with Adaptec's 7800 Family Manager Set software (v1.3), see the 7800 Family Manager Set software documentation for driver installation instructions.

- **NetWare, OS/2, and UNIX:** Drivers for these operating systems are *not* embedded, so you must load them yourself. If your host adapter came bundled with Adaptec's 7800 Family Manager Set software (v1.3), see the 7800 Family Manager Set software documentation for driver installation instructions.



Note: If you purchased your host adapter from a third-party vendor, you can use the drivers they provide. (Refer to the third-party documentation for installation instructions and problem resolution.) To obtain any of the Adaptec device drivers, contact Adaptec directly.

Congratulations! You have successfully installed your host adapter. For more information on configuring your host adapter, see *Helpful Hints*.

Helpful Hints

Configuring SCSI Devices

Your host adapter can transfer data up to 10 MBytes/sec. SCSI devices can coexist on the same cable, and each will transfer data at its own negotiated or assigned transfer rate. However, in order to reliably transfer data at the transfer rate of Fast SCSI, the following requirements must be met:

- The internal cable must be terminated with an *active* terminator, either provided by the SCSI device at the end of the cable or by a separate terminating plug. The terminator on the AHA-2910C is an active terminator.
- Be sure to use a high-quality internal SCSI cable to ensure reliable data transfer for SCSI devices connected to the host adapter.



Note: Always leave parity checking enabled to verify reliable data transfers.

- When one or more Fast SCSI devices are connected to the host adapter, the combined length of all cables must not exceed 3 meters (9.8 feet) to ensure reliable operation and data transfers of up to 10 MBytes/sec.
- Your host adapter can support the SCSI Configured AutoMatically (SCAM) protocol, which automatically assigns SCSI IDs dynamically and resolves SCSI ID conflicts. To enable or disable SCAM support, see *Advanced Configuration Options* on page 8.

Configuring Disk Drives

- The AHA-2910C product does not support the boot option. To boot your system, use an IDE board or a second SCSI host adapter with boot capabilities.
- Every SCSI hard disk must be physically low-level formatted, partitioned, and logically formatted before you can use it to store data.

If you connected a new SCSI hard disk drive to your host adapter, you must partition and logically format the drive. For DOS and Windows (3.x and 95) use the AFDISK and FORMAT commands (see your computer and DOS documentation). For other operating systems, see your operating system documentation.

Installing Multiple Adapters

- You can install multiple SCSI host adapters if the system resources are available (e.g., I/O port must be unique).
- Each host adapter you install forms a separate SCSI bus with a different set of SCSI devices.
- In a system with multiple host adapters, all devices on each SCSI bus (attached to each host adapter) must have a unique SCSI ID.

Windows 95 Driver Installation

To make sure that your AHA-2910C driver software has been properly installed and is operating under Windows 95, do the following:

- 1 On the Win95 desktop click **Start**. An options menu appears.
- 2 On the options menu click on **Setting** and select **Control Panel**.
- 3 Click on **System**. The System Properties window appears.
- 4 Click on **Device Manager**.
- 5 Click on the **SCSI Controllers** icon.
- 6 If the Adaptec AIC-7850 PCI SCSI Controller is not listed, follow the instructions in the EZ-SCSI or the 7800 Family Manager Set documentation for installing driver support.

OR

If you see a yellow exclamation point or red X in front of the listing for the AIC-7850 Controller, double-click the icon to see the error message and correct the problem.

Using SCSISelect

The SCSISelect configuration utility allows you to change host adapter settings without opening the computer case. SCSISelect also contains SCSI disk utilities that allow you to perform a low-level format or verify the disk media of your SCSI hard disk drives.

Starting the SCSISelect Utility

To enter the SCSISelect utility, insert the SCSISelect floppy disk and then boot your system. To select either a color or monochrome display, press **F5** (*this feature may not work on all monitors*).

Using SCSISelect Menus

SCSISelect uses menus to list the options you can select. To select an option, use either the **Tab** key or the up/down arrow keys to move the cursor. Then press **Enter**.

When you select an option by pressing **Enter**, the system may display an additional options menu. Return to the previous menu at any time by pressing **Esc**. To restore the original SCSISelect default values, press **F6**.

Exiting SCSISelect

To exit SCSISelect press **Esc**. A message prompts you to exit (if you changed any host adapter settings, you are prompted to save the changes before you exit). At the prompt, select **Yes** to exit, then press any key to reboot the computer. Any changes you made in SCSISelect take effect after the computer boots.

Default Settings

The AHA-2910C has default settings appropriate for most PCI systems (see the table of settings below). *Do not* run *SCSISelect* unless you want to change a default setting.

| SCSI Bus Interface Definitions | Default |
|----------------------------------|---------------|
| Host Adapter SCSI ID | 7 |
| SCSI Parity Checking | Enabled |
| Host Adapter SCSI Termination | Automatic |
| Additional Options | Default |
| ➤ SCSI Device Configuration | |
| Initiate Sync Negotiation | Yes (Enabled) |
| Maximum Sync Transfer Rate | 10 MBytes/sec |
| Enable Disconnection | Yes (Enabled) |
| Additional Options | Default |
| ➤ Advanced Configuration Options | |
| Plug and Play SCAM Support | Disabled |

Definitions of SCSISelect Settings

This section defines the SCSI device settings for the host adapter and for each device on the SCSI bus.

SCSI Bus Interface Definitions

The following definitions are most likely to require modification:

- **Host Adapter SCSI ID**—This option sets the SCSI ID of the host adapter.

To give the host adapter the highest priority on the SCSI bus, we recommend that you leave the host adapter at its default setting of SCSI ID 7.
- **SCSI Parity Checking**—This option determines whether the host adapter verifies the accuracy of data transferred on the SCSI bus. The default setting is *Enabled*.

If any SCSI device connected to the host adapter does *not* support SCSI parity, disable SCSI Parity Checking on the host adapter and all SCSI devices. To determine if a device supports SCSI parity, consult the device documentation.

- **Host Adapter SCSI Termination**—This option sets termination on the host adapter. You can set termination to *Automatic*, *Enabled*, or *Disabled*. In general, you should leave this option set to its default setting of *Automatic*.

SCSI Device Configuration Options

SCSI device configuration options allow you to configure parameters for each device on the SCSI bus. To configure a specific device, you must identify the SCSI ID assigned to that device. To determine the SCSI ID of a device, see *Using the SCSI Disk Utilities* on page 9.

- **Initiate Sync Negotiation**—This option determines whether or not synchronous data transfer negotiation between the host adapter and a device is initiated by the host adapter.

The default setting is *Yes (Enabled)*. Set **Initiate Sync Negotiation** to **No** for devices that do not support Sync Negotiation.

- **Maximum Sync Transfer Rate**—This option sets the maximum synchronous data transfer rate that the host adapter supports. The host adapter supports rates up to 10 MBytes/sec.

If Initiate Sync Negotiation is set to **No**, then the maximum synchronous transfer rate is the maximum rate that the host adapter accepts from the device during negotiation.

- **Enable Disconnection**—This option lets a SCSI device temporarily disconnect the SCSI device from the SCSI bus. This allows the host adapter to perform other operations while the SCSI device is disconnected. The default setting is *Yes*. Set **Enable Disconnection** to **Yes** if two or more SCSI devices are connected to the host adapter.

Advanced Configuration Options

Plug and Play SCAM Support—This option allows the host adapter to automatically assign SCSI IDs to SCSI devices that support the SCAM protocol.



Caution: The default setting is *Disabled*. Most non-SCAM legacy devices tolerate the SCAM protocol, so you can enable this option even if you have a non-SCAM device.

Using the SCSI Disk Utilities

To access the SCSI disk utilities, select the **SCSI Disk Utilities** option from the menu that appears after starting *SCSISelect*.

Once the option is selected, *SCSISelect* immediately scans the SCSI bus and displays a list of all SCSI IDs and the devices assigned to each ID. When you select a specific ID and device, a menu appears, displaying the options **Format Disk** and **Verify Disk Media**.

- **Format Disk**—This utility allows you to perform a low-level format on a hard disk drive. Most SCSI disk devices are preformatted at the factory and do not need to be formatted again.

The Adaptec Format Disk utility is compatible with nearly all of SCSI disk drives.



Caution: A low-level format destroys all data on the drive. Be sure to back up your data before performing this operation. You *cannot* abort a low-level format once it is started.

- **Verify Disk Media**—This utility allows you to scan the media of a hard disk drive for defects.
If the utility finds bad blocks on the media, it prompts you to reassign them. If you select **Yes**, those blocks are no longer used. You can press **Esc** at any time to abort the utility.

Troubleshooting Checklist

If you have any problems during the installation, check the following items first:

- Have you installed the host adapter into a PCI Rev 2.0 compliant computer?
- Are all SCSI devices powered?
- Are all SCSI bus cables and power cables properly connected? Is pin 1 oriented correctly?
- Does the host adapter and each device on the SCSI bus have a unique SCSI ID?
- Did you install your host adapter in a bus master PCI slot? Refer to your computer's documentation for instructions or try another slot.
- Are the devices at the extreme ends on the SCSI bus terminated properly?
- Does your system CMOS setup require you to enable PCI bus parameters? If so, refer to your computer's documentation for instructions. Check that IRQ channel assignment, board, and BIOS settings have been made.
Some configuration options apply to a specific PCI bus slot, so if you change these options be sure you are applying them to the slot in which the host adapter is installed.
Check your computer documentation to verify which slot corresponds to which number.
 - If there is an Interrupt Type or Interrupt Line option in the Setup program, be sure to select **Int-A** or **Interrupt Type = A**. Depending on your system design, you may also be required to change a motherboard jumper setting.
 - If there is a Triggering Interrupt option, be sure to select **Level**.
 - If there is an option to enable or disable bus mastering for the PCI slots, be sure to select **Enabled**.
 - If there is an option to enable or disable individual PCI slots, be sure the slot in which you install the host adapter is **Enabled**.
 - If your computer has a combination of ISA (or EISA) boards and PCI boards, you may need to mark the IRQs used by ISA/EISA boards as *Used* so the system BIOS will not try to assign these IRQs to other PCI boards.
 - In some systems the BIOS reserves a set of available IRQs for PCI boards, and you have to assign these IRQs manually.

Common Problems and Solutions

- **Changed Values Not Loaded**—If you changed any values on the host adapter in a Setup program or on a SCSI device, select the **Saved** option to ensure that the new values are loaded.
- **Format/Verify Disk Device Utility Startup Fails**—If you tried to use the Format/Verify utility on a disk device and got an Unexpected SCSI Command Failure pop-up box with error information, the utility probably encountered a problem with the disk device or the media and therefore cannot run.

You can probably determine from the Sense Key information (e.g., 06h - Unit attention) both the cause of the problem and its solution. Listed below are some of the more common Sense Key values and their meanings:

02h - Not ready—The media is not ready to format. Be sure that media is inserted in the drive and that the media is spun up.

03h - Medium error—The disk media may be defective. If it is a removable-media drive, try using a different disk media. If it is a fixed disk drive, the disk may be physically damaged. Verify and format the media with *SCSISelect*.

04h - Hardware error—The disk drive may be defective. Consult the hardware documentation and contact the manufacturer.

06h - Unit attention—The removable media may be write-protected. Disable write protection and run the utility again.

Federal Communications Commission Radio Frequency

Interference Statement

WARNING: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. However, if this equipment does cause interference to radio or television equipment reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

Use a shielded and properly grounded I/O cable and power cable to ensure compliance of this unit to the specified limits of the rules.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

Adaptec, Inc. AHA-2910C



Tested to Comply
With FCC Standards

FOR HOME OR OFFICE USE

Canadian Compliance Statement

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.





CORINA

Servicing Instructions

Version 2.0
101 118 01...24

227 437 01 SA(e) Revision D



marquette

A GE Medical Systems Company

Caution:

During repairs/service interventions, observe the protective measures against damage due to ESD.

- * Marquette Hellige GmbH considers itself responsible for the effects on safety, reliability, and performance of the equipment, only if:
 - assembly operations, extensions, readjustments, modifications, or repairs are carried out by Marquette Hellige GmbH or by persons authorized by Marquette Hellige GmbH,
 - the electrical installation of the relevant room complies with the applicable national and local requirements, and
 - the instrument is used in accordance with the instructions for use.
- * This manual contains service information; operating instructions are provided in the user manual of the instrument.
- * This manual is in conformity with the instrument at printing date.
- * All rights are reserved for instruments, circuits, techniques, and names appearing in the manual.

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Revision History

Each page of this manual has the document number followed by a revision letter, located at the top of the page. This letter identifies the manual update level. The latest letter of the alphabet corresponds to the most current revision of the document.

The revision history of this manual is summarized below.

| Date | Revision | Remarks |
|----------------|-----------------|--|
| November 1994 | A | Initial release of Servicing Instruction |
| September 1997 | B | Update |
| December 1998 | C | New variants (101 118 21...24), ECO # 061299 |
| March 2000 | D | Update, ECO # 064158 |

1. Context

CORINA is an ECG recorder for the system CardioSys and CardioSoft. CORINA stands for **C**ORD **I**NTEGRATED **A**MPLIFIER and is an interface between patient and personal computer. There are six CORINA models.

1.1 Model 1 *CORINA*

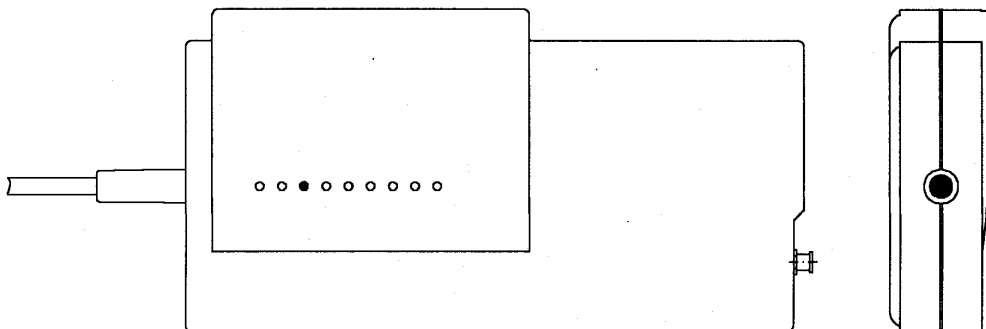
comprises the following components:

Compact plastic casing with interfaces for patient cable and connection cable to PC. All the electronics are integrated inside the casing. This includes ECG preprocessor, controller to buffer data, data converter and transfer to PC. The electronics has its own power supply.

1.2 Model 2 *CORINA with Suction Pump*

is designed for use with the Electrode Application System. The casing also houses the suction pump with the additional electronics required.

Casing design CORINA models 1 + 2:



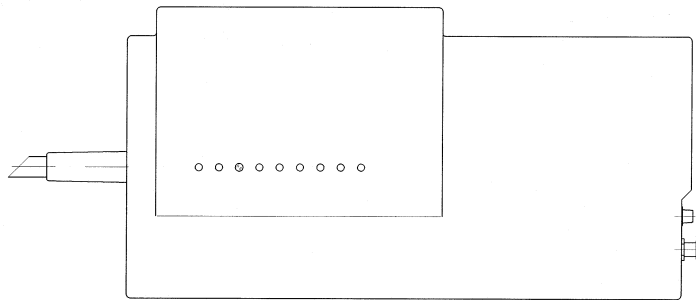
1.3 Model 3 *CORINA with Analog Output*

as Model 1 plus additional analog ECG output. This output enables CORINA & CardioSoft models prior to release 3.0 output of lead II. The output signal of the analog output in the stress test mode is configurable for CORINA & CardioSoft Version 3.0 or higher.

1.4 Model 4 *CORINA with Suction Pump and Analog Output*

is a combination of Model 2 plus additional analog ECG output.

Casing design CORINA models 3 + 4:



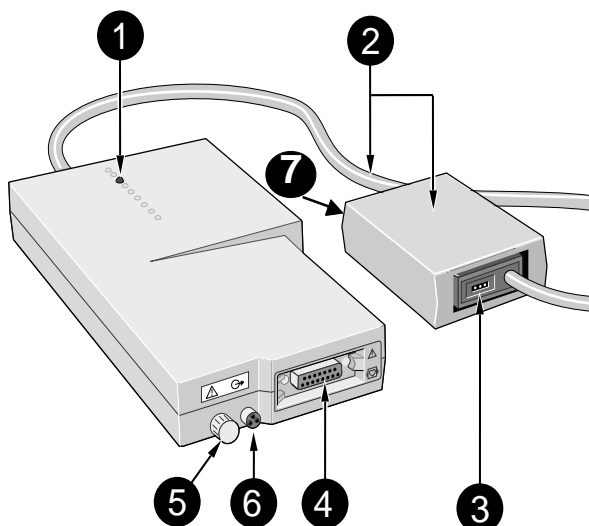
1.5 Model 5 *CORINA Standalone*


The CORINA standalone is an ECG recorder constituting the analog connection between the patient and the processing instrument. It operates without a PC (=> standalone) and delivers the channel II signal (unedited signal, without filter and ADS, pacing pulse blanked out) at the analog output. As in the standard CORINA it receives its power supply from a separate plug-in power supply with the necessary operative voltage.

1.6 Model 6 *CORINA Standalone with Suction Pump*

This model is the same as Model 5 with an additional connection for the Electrode Application System.

CORINA Standalone



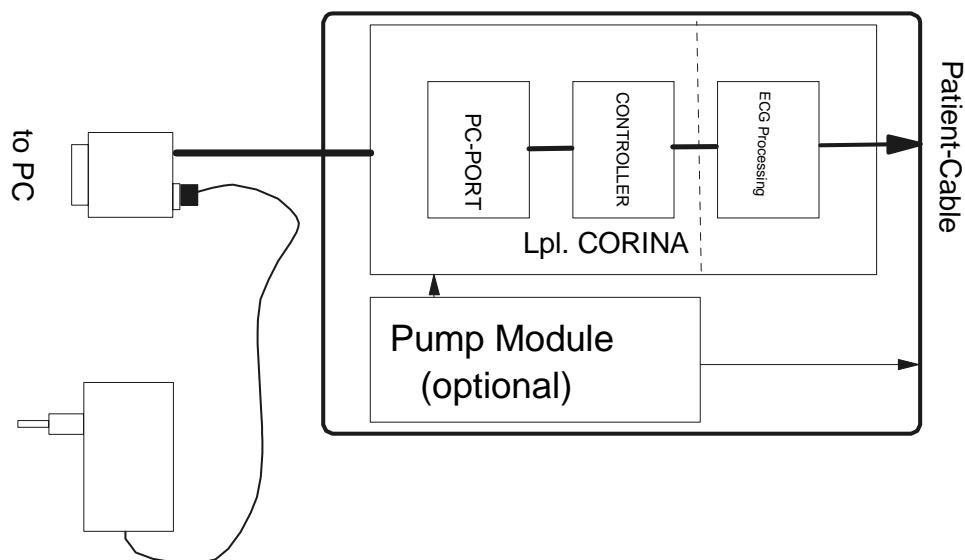
- 1 Is on when the instrument is receiving a power supply
- 2 Power cable and insulating casing
- 3 Connector for plug-in power supply
- 4 Connector for patient cable
- 5 Pump output for Electrode Application System
- 6 ECG output 1 V
- 7 Interference suppression lead 

1.7 Replacement of CORINA Model 1...4 through newer CORINA Variants with enhanced communication interface to PC (101 118 31...44)

Remark: This models will only work with CardioSoft V. 4.14 or higher. When using the new modes, you can also use the new Power Supply SW 172 (or as default the FW 7324/2 Power Supply).

CORINA Block Circuit Diagram

Block circuit diagram of CORINA models 1 + 2, in models 3 to 6 there is an additional functional block (= PCB CORINA TRIGGER) to generate the analog signal).



2. Introduction

The “Hardware Design Description” describes the structure of the hardware implemented, internal interfaces and those for connection of peripherals.

2.1. Repair Procedure

CORINA can be repaired only with the standard repair kit.

A number is stored in the CORINA which allows the accurate assignment of user and software options.

Repairs conducted by:

- Availability of AT PCBs CORINA (4 types, 2 with and 2 without the possibility of plugging in the PCB CORINA TRIGGER)
- Availability of a programming tool, i.e., software in English. The programming tool is a part of CardioSoft. (...\\CARDIO\\SERIEN.EXE)

This tool enables the authorized service technician to program the replaced CORINA PCB with the customer-specific serial number. The AT PCB is programmed with a specific number. This number only allows the PCB to be modified by overwriting.

Replacement works with the AT PCB only. The AT PCB can be programmed once only.

To come into the programming mode you have at first to click to: FILE --> LOGIN

Password = HELSERV

Then click to: “CORINA --> Set CORINA serial number”

For typing in the serial no, please use only the last 7 digits from the serial no on your name plate of the CORINA! (With CardioSys or MicroLab please use the serial no. of the complete system!)

For example: CORINA Serial No: 101 003 789
Type in only: ↑↑1 003 789
 are not used

No repair kits are necessary for models 5 + 6, they do not contain a serial number. If necessary, as in the case of PCB CORINA TRIGGER, the PCB CORINA can be replaced.

3. Hardware Structure

3.1 Physicomechanical Structure

CORINA comprises 4 (optionally 8) mechanical functional units.
These are:

- casing
- floating screening
- PCB CORINA (5 types: a) 2x standard, b) 2x for Analog Out, c) standalone)
- cable to PC
- pump module for Electrode Application System (optional)
- PCB CORINA TRIGGER (optional)
- insulating foil for PCB Analog Out (optional)
- internal wiring Analog Out (optional)

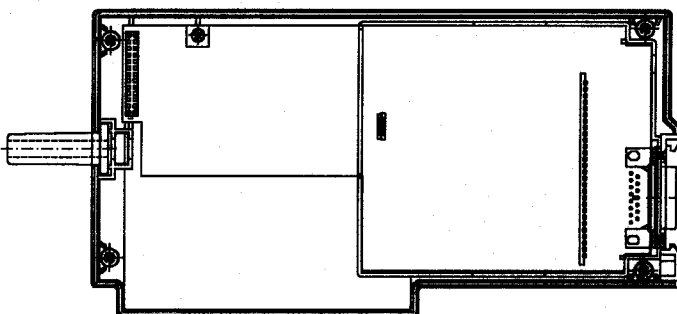
3.1.1 Casing:

The casing comprises the following components.

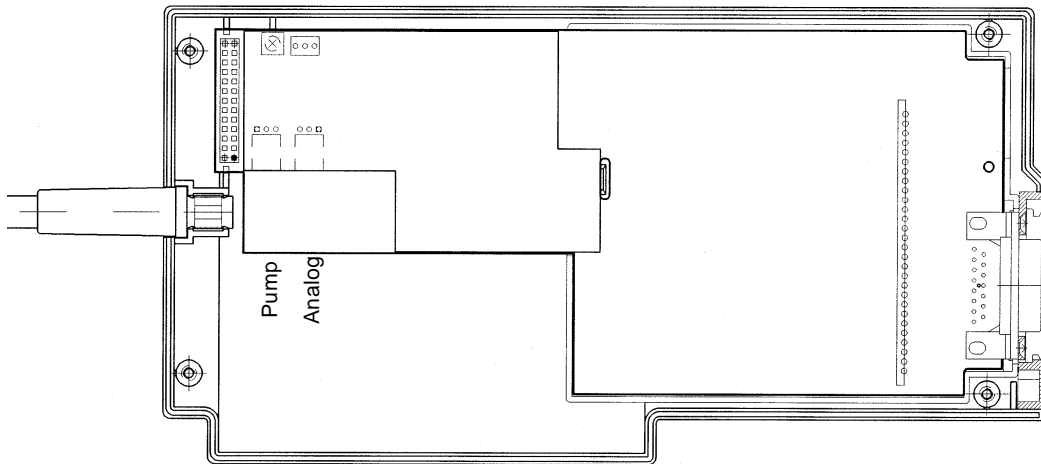
- lower case shell
- upper case shell
- locking device

The pump module (optional) is affixed to the lower section of the casing. The PCB and the floating screening are attached to the upper section. The locking device is screwed to the PCB and serves to secure the Marquette HELLIGE patient cable.

Upper case shell with integrated PCB:



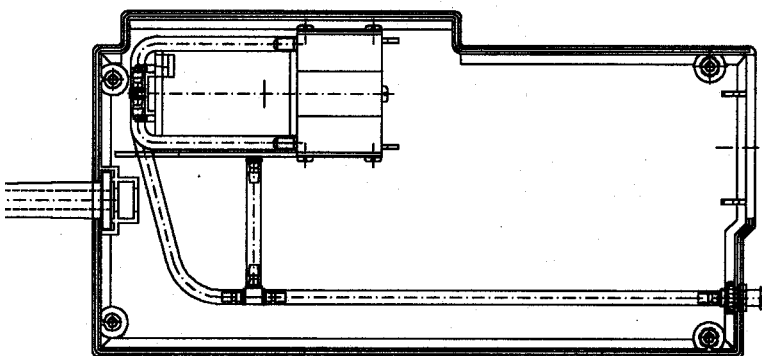
Upper case shell with integrated PCB, incl. PCB CORINA TRIGGER:



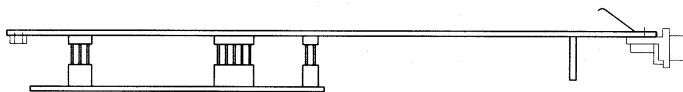
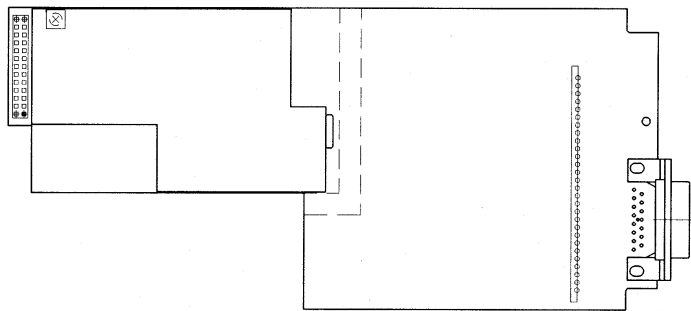
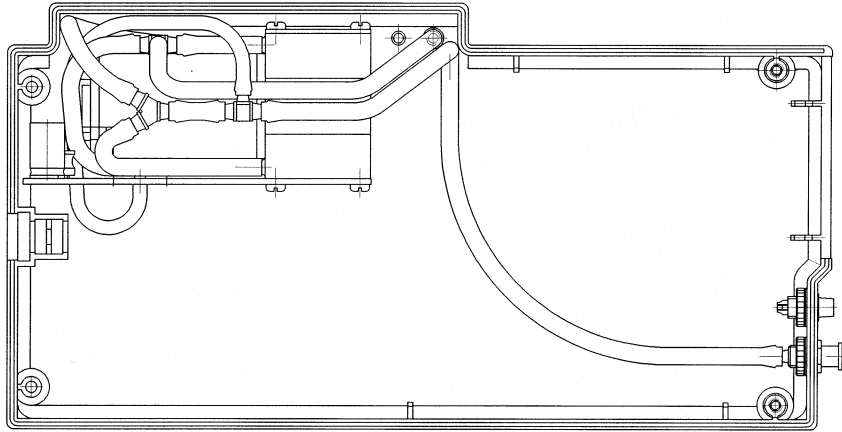
3.1.2 Floating screening:

The floating screening comprises a plastic shell with a floating shield cemented in place. The plastic shell is secured with the locking device and by clipping it in onto the PCB. On the one hand, the floating screening protects the highly sensitive electronics from interference while on the other hand, the plastic shell ensures a defined safe gap to the metal plating of the casing.

Lower case shell with integrated pump module (old tubing system):



Lower case shell with integrated pump module (new tubing system):



3.1.3 PCB CORINA

There are 5 PCB versions:

a) 2x Standard b) 2x for Analog Out c) Standalone

a) 2x Standard PCB:

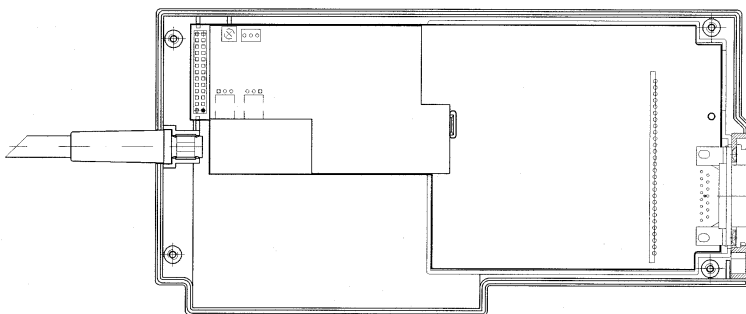
The entire electronics as well as all interfaces are located on the PCB. The patient input socket is fixed permanently to the PCB. The lead to the PC and the power supply cable to the pump are plugged in. The operational readiness display (LED green) is also located on the PCB. When operative the light is transmitted to the outside of the casing via an optical fiber. The newer PCB version, used in CORINA 101 118 31...32 and 101 118 41...42 provides a newer communication protocol to the PC and will not work inside other (older) CORINA variants.

b) 2x CORINA PCB model for CORINA TRIGGER (Analog Out)

It has longer male multipoint connectors than the standard PCB model. The PCB CORINA TRIGGER is plugged into this and the internal analog lead as well as, optionally, the suction pump connected.

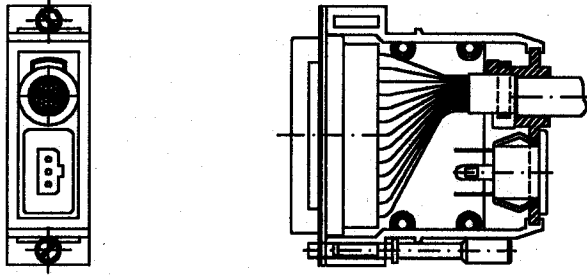
The newer PCB version, used in CORINA 101 118 33...36 and 101 118 43...44 provides a newer communication protocol to the PC and will not work inside other (older) CORINA variants.

c) The CORINA PCB model for the CORINA standalone is almost exactly the same as model b). The PCB CORINA TRIGGER is also plugged in here and the internal analog lead as well as, optionally, the pump power supply connected.



3.1.4 Cable to PC:

The connection cable to the PC has a 25-pin plug on the PC side“. The plug casing also houses a 3-pin socket. A plug-in power supply, supplying CORINA with power, is then connected to this socket. On the CORINA side“ is a 26-pin socket terminal strip. This is then plugged directly onto the PCB.



Pin Connections (25-Pin Plug up to 101 118 24)

| Pin | Wire Color | Pin | Wire Color | Pin | Wire Color |
|-----|------------|-----|------------|-----|------------|
| 1 | wh_ye | 8 | br_vi | 16 | wh_br |
| 2 | br_ye | 9 | br_bl | 17 | wh_bk |
| 3 | br_or | 10 | wh_bl | 18 | wh_vi |
| 4 | br_rd | 11 | wh_gn | 19 | wh |
| 5 | br_bk | 12 | wh_gr | 20 | gr |
| 6 | br_gn | 13 | wh_rd | 21 | bk |
| 7 | br_gr | 14 | wh_or | | |

Pin Connections (25-Pin Plug, CORINA variants up from 101 118 31)

| Pin | Wire Color | Pin | Wire Color | Pin | Wire Color |
|-----|------------|-----|------------|-----|------------|
| 1 | | 8 | br_vi | 15 | wh_br |
| 2 | br_ye | 9 | br_bl | 17 | wh_bk |
| 3 | br_or | 10 | wh_bl | 18 | wh_vi |
| 4 | br_rd | 11 | wh_gn | 19 | wh |
| 5 | br_bk | 12 | wh_gr | 20 | gr |
| 6 | br_gn | 13 | wh_rd | 21 | bk |
| 7 | br_gr | 14 | wh_or | | |

Pin Connections (3-Pin Plug)

| Pin | Wire Color | Pin | Wire Color | Pin | Wire Color |
|-----|------------|-----|------------|-----|------------|
| 1 | rd or | 2 | br ye | | |

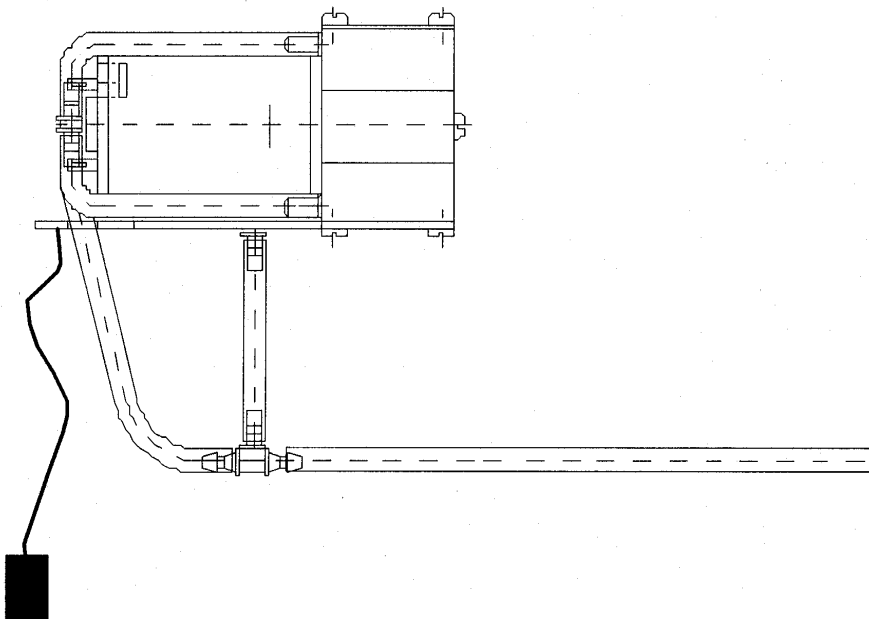
(*) Wires br and bk are cut off in PC cables manufactured after May 1997.

3.1.5 Pump Module:

The pump module comprises the following components:

- pump
- PCB
- tubing connection

Pump (old tubing system)

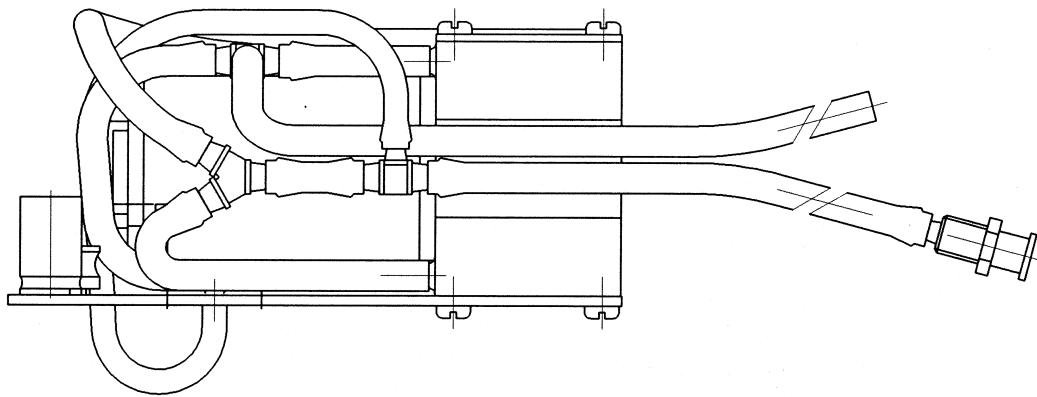


Pump:

When using the PCB Analog Out the power line to the suction pump (optional) is not plugged into the PCB CORINA, but the PCB CORINA TRIGGER.

Important: When used together with the PCB CORINA TRIGGER, the braided pump power supply wires must be covered by a heat-shrinkable tube!

Pump (new tubing system)



PCB:

The PCB is screwed onto the pump casing. The electronics for pressure regulation is located on the PCB. The 12-V power cable is soldered to the PCB.

Tubing connection:

The air tubing is preassembled and only needs connecting to the nozzle (on the casing).

3.1.6 PCB CORINA TRIGGER

There is a floating, analog ECG output based on an optional plug-in card. It provides a 1V/1mV signal (unedited signal, without filter and ADS, pacing pulse is blanked out) at the analog output. The PCB CORINA TRIGGER only needs plugging in. It remains firmly attached without requiring any additional fixation. The standard signal to be output is a lead II signal. For CORINA and CardioSoft Version 3.0 and later versions the output signal can be configured in the stress test mode.

Peripherals can be connected via a 3-pin output socket. Pin assignment of this socket: Pin 1 = Analog Out, Pin 2 = ground, Pin 3 = reserved (also refer to Section 3.4.2.3)

3.1.7 Insulation Foil for PCB CORINA TRIGGER

The insulation foil serves to effect floating isolation of the analog section of the PCB CORINA TRIGGER with reference to the casing and (optionally) to the pump.

3.1.8 Internal Wiring of the Analog Output

The connection from the analog output of the PCB CORINA TRIGGER to the 3-pin output socket on the casing is effected using a lead covered by a heat-shrinkable tube. For EMV purposes there are two wide-band interference suppression coils inside this tube. Using this tube effects high-voltage-resistant isolation between the analog output signal and ground and patient floating part.

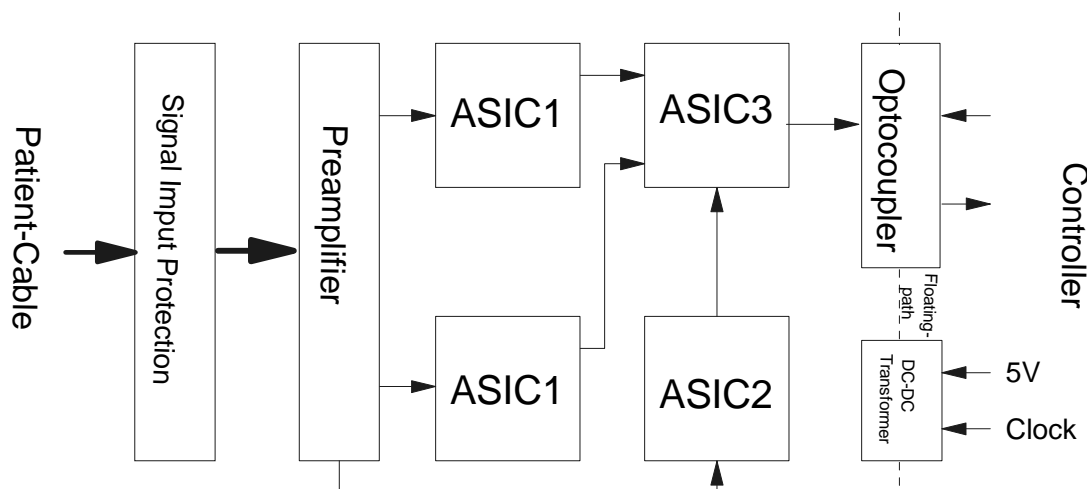
3.2 Electrical and electronic structure

The entire CORINA electronics is divided up into three functional units and located on a PCB. These are ECG CONDITIONING, CONTROLLER and PC PORT. (In addition, optionally, Analog Out electronics on the plug-in PCB CORINA TRIGGER).

3.2.1 ECG Processing

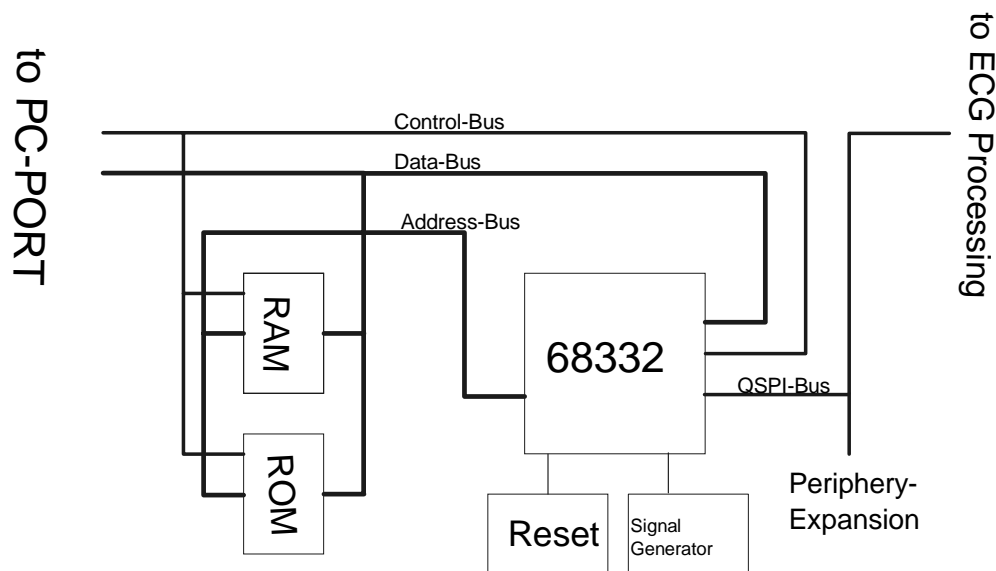
- acquisition and analog-digital conversion of the ECG signals via up to 11 electrodes
- preprocessing and intermediate storage of the data
- data transfer via a serial interface
- additional functions are: pace identification, checking and testing functions, configuration of the inputs, N negative-feedback loop, measurement of d.c. voltage and blocking function

Transfer of data between the functional unit ECG Processor and CONTROLLER is via a QSPI interface. The exact specifications are described in the document [ASIC Interface].



3.2.2 CONTROLLER:

- all CORINA control functions
- initialization of hardware
- data communication from and to the functional unit ECG Processor
- data communication from and to the functional unit PC PORT
- output of ECG data to DA transducer on PCB CORINA TRIGGER (optional)



CORINA is controlled by the Controller 68332. This controller already has all the important functions required to control CORINA.

These are:

- **CPU** (68000 family plus 68020 commands plus commands for controller applications)
- **2 serial interfaces** (SCI, QSPI)
- **on-chip memory** (for faster applications)
- **maximum of 12 programmable chip selects**
- **interrupt manager**
- **intelligent 16-bit timer**
- **clock generator**

Memory:

A 128 kByte FLASH (128 K x 8 PEROM), which can be programmed directly with the 5-V operating voltage supply, is used as a program memory store. This permits the subsequent loading of software updates using the PC. The data memory comprises the ON-The interrupt requests IEKG_ and IPCPW_ are both stored by using FLIPFLOPS, since the interrupt inputs IRQ1 to IRQ6 are only level gated. In contrast to the others, IRQ7 is edge gated and can thus be actuated directly.

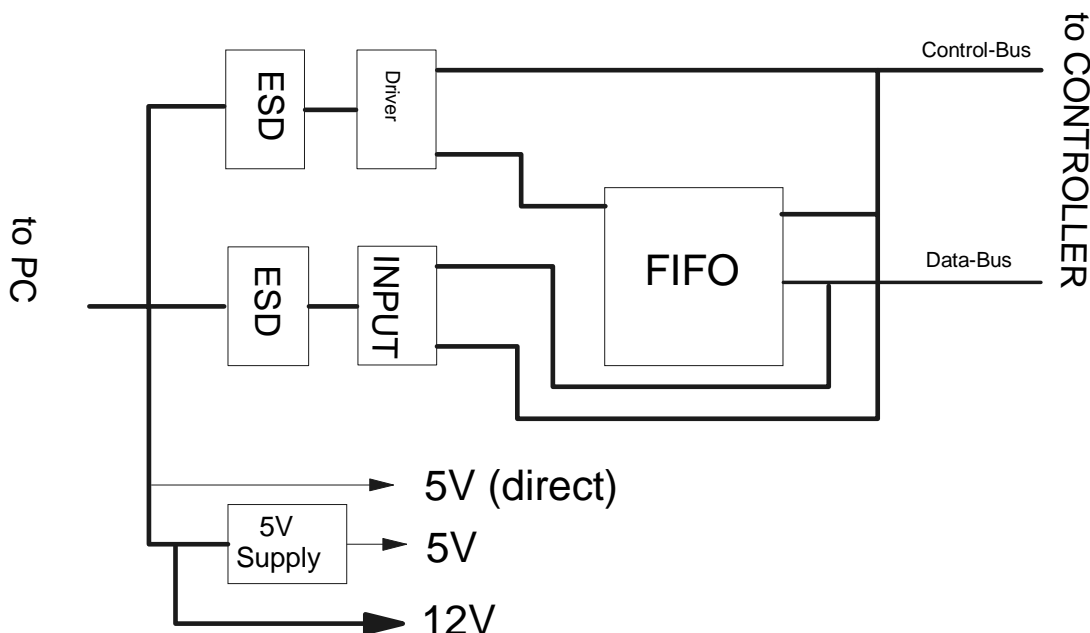
Resets are generated by a MICROPROCESSOR SUPERVISORY CIRCUIT.

A floating section is used to connect the functional unit ECG Processor to the QSPI interface of the 68332. This is a full duplex interface with data input MISO (Master-In Slave-Out), data output MOSI (Master-Out Slave-In) and serial clock SCK. A maximum of 4 devices can be connected to this interface. To achieve this, the PCB is equipped with a connector onto which this bus can be switched in. Using this connector thus allows the connection of a maximum of 3 further peripherals (e.g., experimental input). One of the peripherals is the PCB CORINA TRIGGER (optional).

A signal transmitter gives an acoustic status message. This signal transmitter enables signalling of errors, for example.

3.2.3 PC PORT:

- CORINA power supply
- ESD protection
- data communication to and from PC



All cables leading to and from the PC are provided with ESD protection.

A DC/DC transducer is used to generate the 5 V. This transducer generates the 5-V power

voltage from the 12 V received from the plug-in power supply. The DC/DC transducer can be switched on and off by the PC via the control cable. There is a connector on the PC to connect the 12 V. The pump module can then be connected to this connector. Data communication between PC and CORINA is via a FIFO. This enables the PC to pick up ECG data at any time. The FIFO has a memory depth of 8 K / 32K X 9 bits, 7/3 bits being used (of these, 6/3 bits for ECG data and 1 bit for synchronization).

All output leads are led through a driver chip.

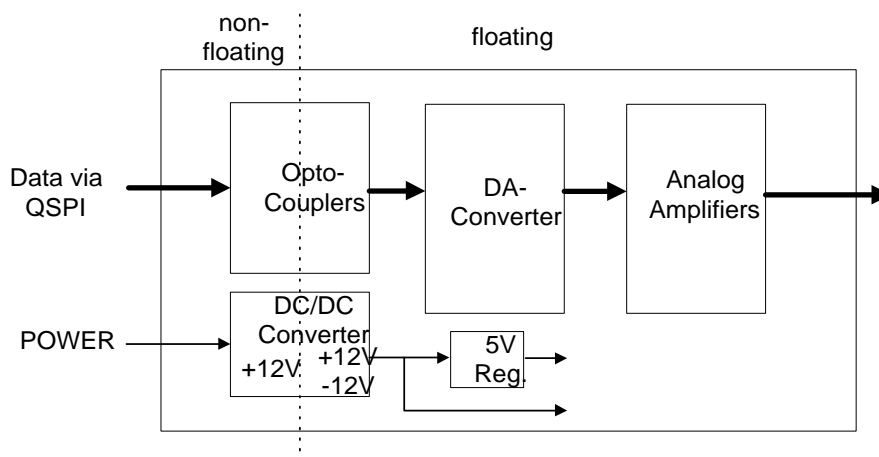
3.2.4 Optional Analog Out Electronics

The PCB CORINA TRIGGER provides the user with a floating analog ECG output signal for connection to ultrasound units. Pacing pulses are blanked out.

Functionality:

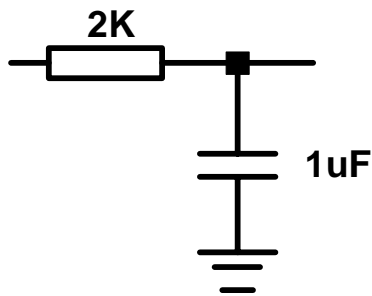
Using QSPI (serial data transfer) the ECG data are transmitted via a medically floating segment to a D/A transducer (10 bits) located on the PCB CORINA TRIGGER. The analog output signal is subsequently standardized, amplified and made available to the user. The signal is short-circuit-proof, unfiltered and does not have ADS bedside processing.

Caution: To enable QRS complex triggering when using PACE, the pacing pulses are removed from the ECG signal.



When connecting up an ultrasound unit it is important to ensure that the instrument connected has an input LPF of < 400 Hz. If this is not the case, an external (passive) low pass should be connected to the input of the peripheral.

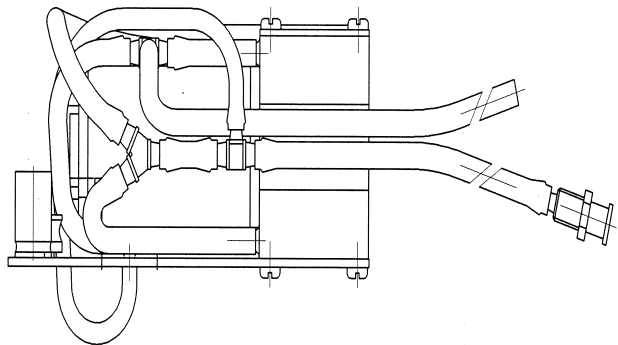
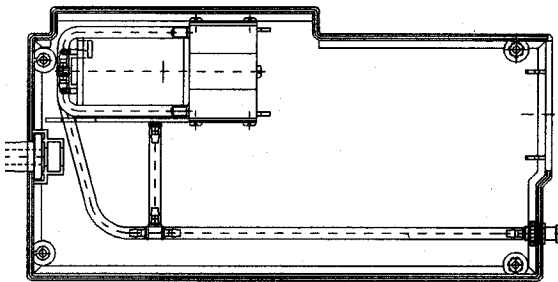
Suitable low-pass configuration:



3.3 Internal Interfaces

3.3.1 Mechanical Interfaces

Tubing connection of the pump module:



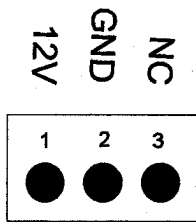
The pump module air tubing is preassembled and only needs connecting to the nozzle (on the casing).

3.3.2 Electrical Interfaces

CORINA has three internal interfaces. These are:

- interface to pump module
- debugging interface
- interface for further peripherals (PCB Analog Out):

Interface to pump module:



Description of interface:

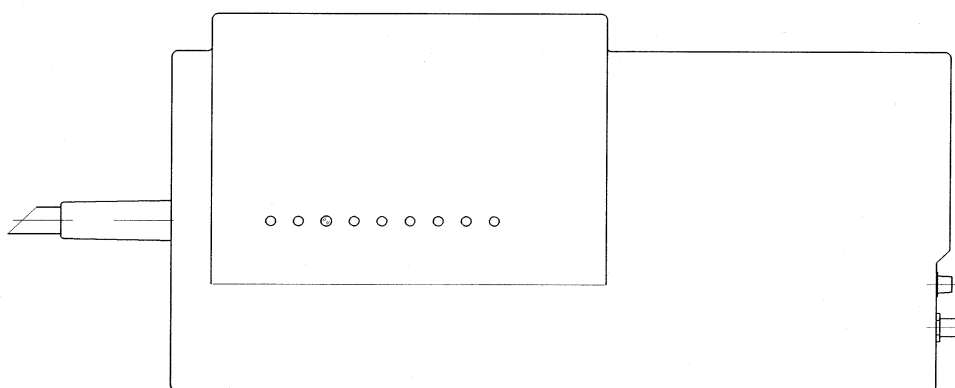
The pump module interface is in the form of a 3-pin male multipoint connector. The pump module requires only a 12-V power supply.

3.4 Interfaces to Peripherals

3.4.1 Mechanical Interfaces

CORINA has three mechanical interfaces. These are:

- power cable to PC
- connection socket for patient cable
- nozzle for air tubing
- optional: Analog Out connector



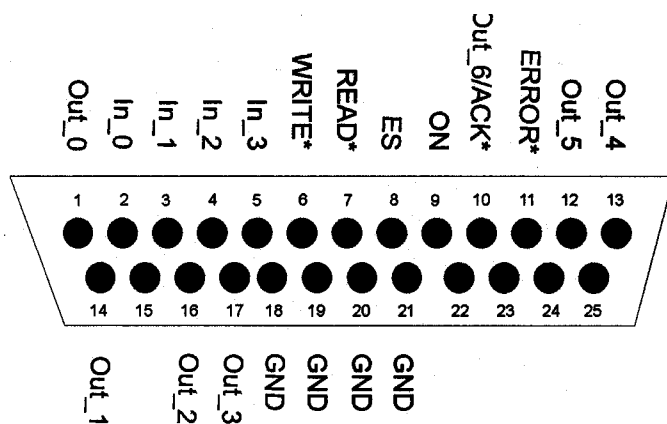
3.4.2 Electrical Interfaces

CORINA has two external interfaces. These are:

- interface to PC
- ECG input
- optional: Analog Out

3.4.2.1 Interface to PC:

Data interface:



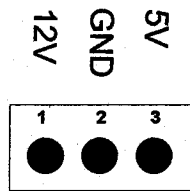
Description of interface:

OUT(0-5) data to PC
 OUT6/ACK data bit to PC and data acceptance confirmation
 this interface lead fulfils two functions
 READ MODE -> data line D6 (data from CORINA -> PC)
 WRITE MODE -> ACK* (data from PC -> CORINA)

For outputs OUT(0), OUT(1) and OUT(3) it is important to observe that these are output inverted by CORINA since, initially, the PC inverts these inputs.
 In newer CORINA versions (101 118 31...36 and 101 118 41...44 a new cable to PC is used, where only OUT (2, 4, 5) are used to transmit data to the PC.

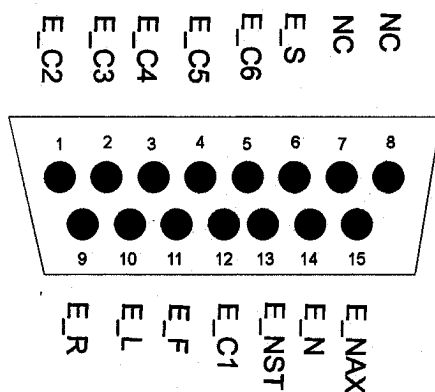
ERROR* indicates "full or empty FIFO"
 IN(0-3) data from PC
 ES selection whether ERROR* should indicate "full or empty FIFO"
 ES = LOW -> CORINA indicates "empt" FIFO
 ES = HIGH -> CORINA indicates "full" FIFO
 READ* transmit data to PC
 WRITE* read data from PC
 ON switch on CORINA
 ON = LOW -> CORINA is switched off
 ON = HIGH -> CORINA is switched on

Power source interface:



As of 05/1997 this interface **no longer** delivers a 5-V signal.

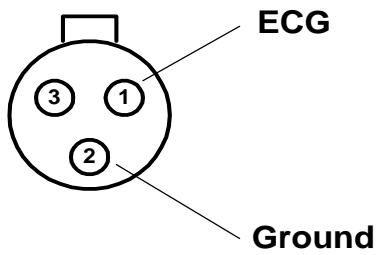
3.4.2.2 ECG Input:



Description of interface:

| | |
|-------|---|
| E_R | electrode input right arm |
| E_L | electrode input left arm |
| E_F | electrode input left foot |
| E_N | electrode input right foot |
| E_C1 | electrode input chest electrode C1 (Wilson) |
| E_C2 | electrode input chest electrode C2 (Wilson) |
| E_C3 | electrode input chest electrode C3 (Wilson) |
| E_C4 | electrode input chest electrode C4 (Wilson) |
| E_C5 | electrode input chest electrode C5 (Wilson) |
| E_C6 | electrode input chest electrode C6 (Wilson) |
| E_NAX | electrode input chest electrode NAX (Nehb) |
| E_NST | electrode input chest electrode NST (Nehb) |
| E_S | shielding |

3.4.2.3 Analog Out



Pin assignment of this socket: Pin 1 = Analog Out, Pin 2 = ground, Pin3 = reserved.

4. Troubleshooting Help Functions

After startup, CORINA performs an internal self-test. The test results are filed in FIFO memory. If an error is detected, an alarm signal also sounds three times in succession. In the models 5 + 6 (CORINA standalone) a sound repeated three times does not indicate an error, but the switching on of the operating voltage.

Meaning of the error messages:

| Self-Test Results (BYTE) | Program Display Value | Meaning |
|-------------------------------|--------------------------|---------------------------------|
| 00000000 | 0 | no error |
| 00000001 | 1 | error in internal RAM of 68332 |
| 00000010 | 2 | error in vector list |
| 00000100 | 4 | error in RAM memory |
| 00001000 | 8 | system software CRC check error |
| 00010000 | 10 | custom software CRC check error |
| 00100000 | 20 | QSPI check error |

When several errors occur together, the relevant bit in each case is set.

Example:

System and custom software CRC check error.

| Self-Test Results (BYTE) | Program Display Value | Meaning |
|-----------------------------|--------------------------|---|
| 00011000 | 24 | System and custom software CRC check error |

5. Safety Analysis Test

5.1 General introduction

The suggested Safety Analysis Tests refer to the international standard IEC 601-1.

The tests are generally performed with Safety Testers, on most of them, the measuring circuits according IEC 601 are already implemented.

The following is a general description of the tests to be performed. For the handling of your Safety Tester follow the user manual.

The tests may be performed under normal ambient conditions of temperature, humidity and pressure and with line voltage.

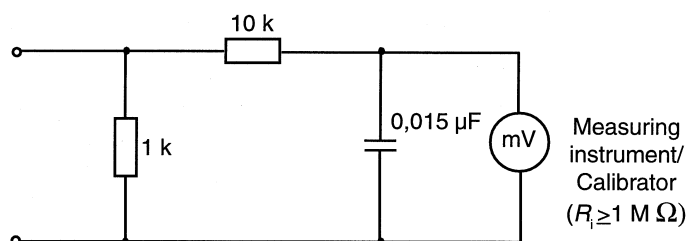
The leakage currents correspond to 110 % of rated voltage for the tested unit. Most Safety Testers take this into account, otherwise the measured values have to be calculated.

5.1.1 Recommended Test Equipment

- Safety Tester for measurements according to IEC 601.
- Testing connector according to the following description.

5.1.2 Leakage Current Measurement

To perform the suggested measurements, the unit under test has to be separated from any interconnection to a system. If the unit is part of a system, extended tests according to IEC 601-1-1 have to be performed. The following diagram shows the Measuring Circuit [M] required for leakage current. The reading in mV corresponds to μA (leakage current). The Safety Testers generally work with this Measuring Circuit [M] and the displayed values are already converted to leakage current.



5.1.2.1 Enclosure Leakage Current Test

This test is performed to measure leakage current from chassis to ground during normal conditions (N.C.) and single fault conditions (S.F.C.).

In all cases, the leakage current is measured from any exposed conductive parts to ground, the unit under test has to be switched on and off.

Connect the Power Supply Adapter from Corina under test to your Safety Tester and measure with the probe to the parallel port connector housing from the Corina.

- During normal conditions (N.C.), referring to the electrical diagram, measurements have to be done under the following conditions:

| | | |
|---|-----------------|--------------|
| * | Polarity switch | NORM and RVS |
| * | GND switch | n/a |
| * | S1 | closed |

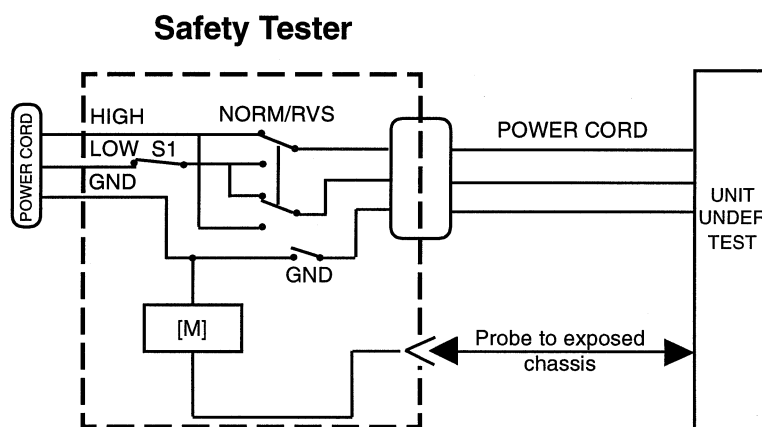
- During single fault conditions (S.F.C.), referring to the electrical diagram, the measurements have to be done under the following conditions:

| | | |
|---|-----------------|--------------|
| * | Polarity switch | NORM and RVS |
| * | GND switch | n/a |
| * | S1 | open |

Test has failed if the measured values are greater than:

| | |
|-------------|---------------------------------|
| N.C. | S.F.C |
| 100 μ A | 500 μ A |
| | 300 μ A (U.L. requirements) |

Electrical Diagram for Enclosure Leakage Current Test



5.1.2.2 Patient Leakage Current Test

This test performs a leakage current test under single fault conditions (S.F.C.) depending on domestic power outlet with 115 or 230 V AC as source into the floating inputs.

In all cases, the leakage current is measured from input jack of unit under test to ground.

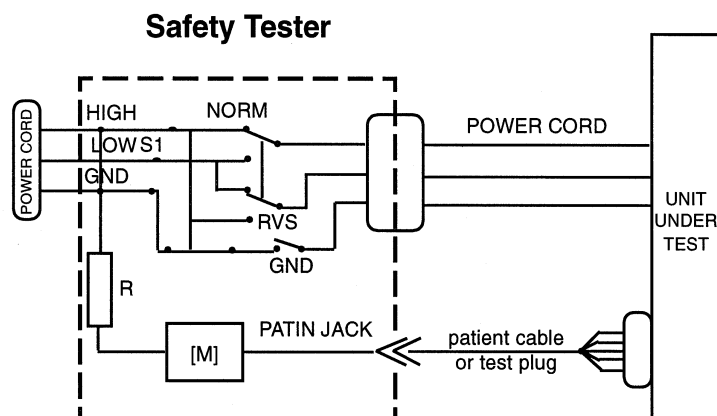
Connect the unit under test to your Safety Tester.

- Referring to the electrical diagram, measurements have to be done under the following conditions:

| | | |
|---|-----------------|--------------|
| * | Polarity switch | NORM and RVS |
| * | GND switch | GND closed |
| * | S1 | closed |

Test has failed if the measured values are greater than 50 μA

Electrical Diagram for Patient Leakage Current Test



For protection of the test person, the following values of resistor R may be used:

Typ CF 100 kOhm (220 to 240 V)

5.1.2.3 Enclosure Leakage Current Test (System)

IMPORTANT

Do not operate devices (PC / VGA Monitor / Printer / ...) in the vicinity of the patient (1,5m / 5ft.) if there are not in the condition with IEC 601-1!

All units there are connected to the CardioSoft system (PC / VGA Monitor / Printer / ...) has to be tested as follow.

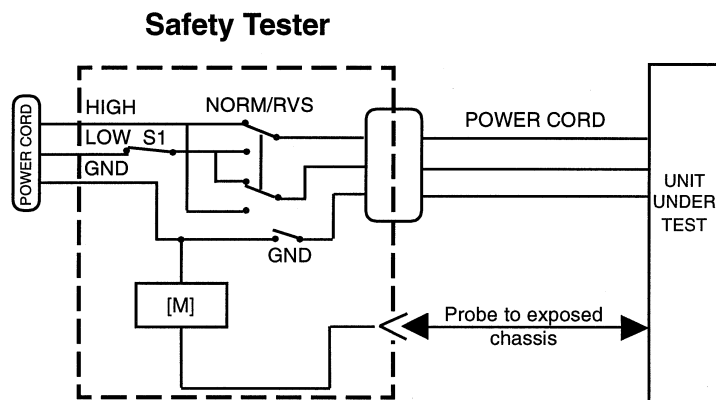
Connect all power cords from the units separately for test to your Safety Tester.

- During single fault conditions (S.F.C.), referring to the electrical diagram, the measurements have to be done under the following conditions:

- * Polarity switch NORM and RVS
- * GND switch GND open
- * S1 closed

S.F.C
3500 μ A

Electrical Diagram for Enclosure Leakage Current Test



5.1.2.4 Protective Earth Resistance Test

The power cord is to be included in the protective earth resistance test. This test determines whether the device has a power ground fault.

- The protective earth resistance from power connector to any protective earth connected exposed conductive part is measured.
- Specs. of test circuit: AC current source 50 Hz/60 Hz of at least 10 A up to 25 A with limited output voltage of 6 V.
- If resistance is greater than 100 mOhm, the unit fails this test.

6. Technical Specifications

Analog output data

Important: ECG signal output to synchronize ultrasound units (not for diagnostic purposes!)

- lead II standard (configurable with CardioSoft/CardioSys V 3.0 and later)
- ECG lead selectable (from CORINA & CardioSoft Version V3.0)
- floating output (± 1500 V referred to ground / chassis)
- 1-V output signal per 1-mV input signal, $U_{\max} = \pm 10$ V
- offset accuracy over the entire range < 300 mV (typically, full deflection)
- accuracy over the entire range (typically) $< 3\%$
- R_L min 2kOhm
- delay < 10 ms
- pacing pulse filtered out
- unedited signal, unfiltered, no ADS
- short-circuit-proof

Power supply

From plug-in power supply unit type FW 7324/2 supplied with the system

The newer PCB version, used in CORINA 101 118 31...36 and 101 118 41...44 you can choose between the FW 7324/2 power supply or the new SW 172 widerange power supply. The default is the FW 7324/2 power supply.

- * design in compliance with protection class II
- * rated voltage range 230 to 240 V AC / 100...250 V (SW 172)
- * operating voltage range 207 to 264 V, 50 Hz / 90 V to 265 V, 50 - 60 Hz (SW 172)
- * rated current 0.22 A
- * power consumption, typically w/o. pump 6 W, with pump 9 W, 15 W max.
with Analog Out, typically, w/o. pump 7,5 W, with pump 16,5 W max.

Environment

Operation

- * ambient temperature between $+10$ and $+40$ ° C
- * rel. humidity between 30 and 75%
- * atmospheric pressure between 700 and 1060 hPa

Storage and transport

- * ambient temperature between -30 and $+60$ ° C
- * rel. humidity between 10 and 90 %
- * atmospheric pressure between 500 and 1060 hPa

Dimensions and Weight

| | |
|--------|--------|
| length | 400 mm |
| depth | 200 mm |
| height | 48 mm |

| | |
|--------|-----------------|
| weight | w/o. pump 700 g |
| | with pump 900 g |

7. Spare Part List

Short Description:

CORINA is an ECG recorder for the system CardioSys / MicroLab and CardioSoft. CORINA stands for CORD INTEGRATED AMPLIFIER and is an interface between patient and personal computer.

| | | |
|---|--|---|
| Power Supply | 91920241 91920242 91920251 2000300-001 | Plug-in Power Supply 230V for CORINA/CardioSoft Plug-in Power Supply 115V, US for CORINA/CardioSoft Power Supply Cable 12V Power Supply 12V - Table Version with International Main Power Input Connector |
| Housing | 43252221 43252261 43252220 90227200 43252231 43252223 92916645 92916648 92916654 50465753 | Lower Shell Upper Shell Upper Shell, OEM (without print) Shield and insulation tube Connection Panel Patient Input Fiber optic Luer connection kit (female) Nut Filler cap Bracket Corina for CardioSys/MicroLab up to V.3.x |
| Necessary Parts to Upgrade the Corina Housing for CardioSys/ MicroLab V4.x | 50466014 92723065 91618976 80177664 84155042 | Bracket Corina for CardioSys / MicroLab from V4.x Spacer between Corina and Bracket. (4 pieces necessary) ATTENTION: Don't forget this parts by mounting! Cable Clamp Screw M3 * 16 DIN 7985 (2 pieces necessary) Screw M3 * 8 DIN 965 (1 pieces necessary) |
| PC-Connection cable | 30344275 2001934-001 91541779 91541780 | Connection Cable to PC for CORINA 10111801... 16 Connection Cable to PC for CORINA 10111831... 44 PANEL PLUG PLUG HOUSING |
| Pump | 30344291 30344485 | Pump 12 V (Standard) Pump for Corina with Analogoutput |
| CORINA 10111801...05 Printed circuit board | 38401548 38900398 | Standard Serv. Kit Corina (necessary for programming of pcb exch. Corina) (consists of: Software-Tool and pcb. AT-Corina 389-003-98) Exchange Pcb Corina |
| CORINA Analog output 10111811 ... 14 | 38900417 38900418 30344492 30344456 91541911 42210957 | Exchange Pcb. Corina Analog Output Exchange Pcb. Corina Trigger Connection Cable analog output Corina, 2,5m length Cable Corina Analog Output (internal) Plug 3-Pin for Analogoutput Insulation |

38401747

~~Standard Service Kit Corina Analogout (for programming
of exch. pcb necessary) (consists of: Software Tool and
exch. pcb Corina Analogoutput 38900417)~~

**CORINA Standalone
10111815...16**

38803235
38900429
50465950

Pcb.Corina Standalone
Exchange Pcb. Corina Standalone
Cover for PC connector Corina Standalone

**CORINA 10111831...32/
10111841 ... 42**

(only for CardioSoft
Version -->= V4.14)

2002899-001
2002980-001

Pcb Corina
Exchange Pcb Corina

**CORINA 10111833 ... 34/
10111843 ... 44**

(only for CardioSoft
Version -->= V4.14)

2002899-002
2002981-001

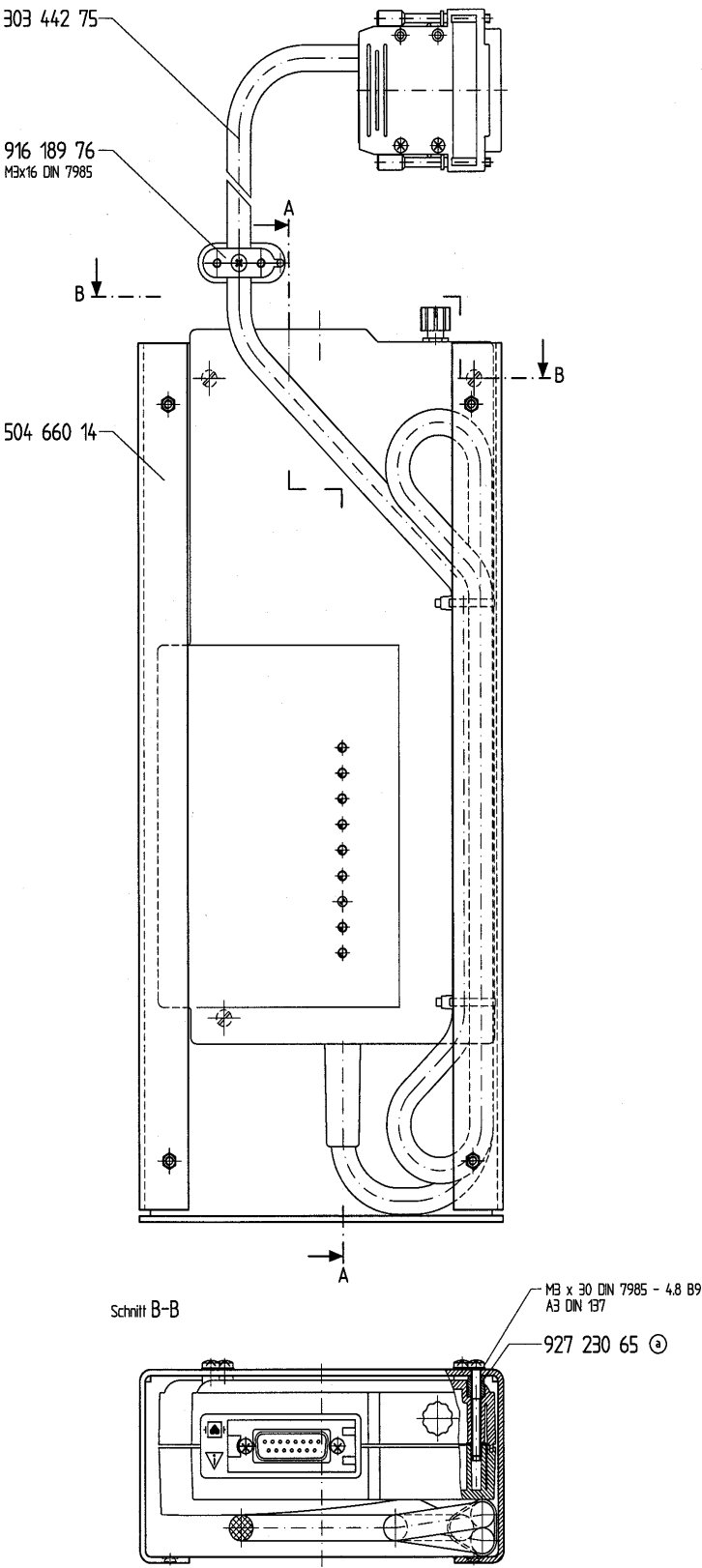
Pcb Corina Analog Output
Exchange Pcb Corina Analog Output

Any questions? Need more info?

send an e-mail to techsupport@marquette-hellige.com

8. Reference Drawings

Mounting Details 101 118 21...24



9. Appendix: Drawings

BTAS = 300
BTBS = 84
LOET = 1536

BEND T500 ~40 DEGREES TO THE LEFT SIDE
T500 NACH LINKS MIT ca.40° ABBIEGEN

TWO FIXATIONS WITH SEALING GLUE 829 023 00
2x FIXIERT MIT DICHUNGSKLEBER 829 073 00

804 177 06
2,7 DIN 125

REMOVE COVER AFTER SOLDERING
ADECKUNG NACH LOETPROZESS ENTFERNEN

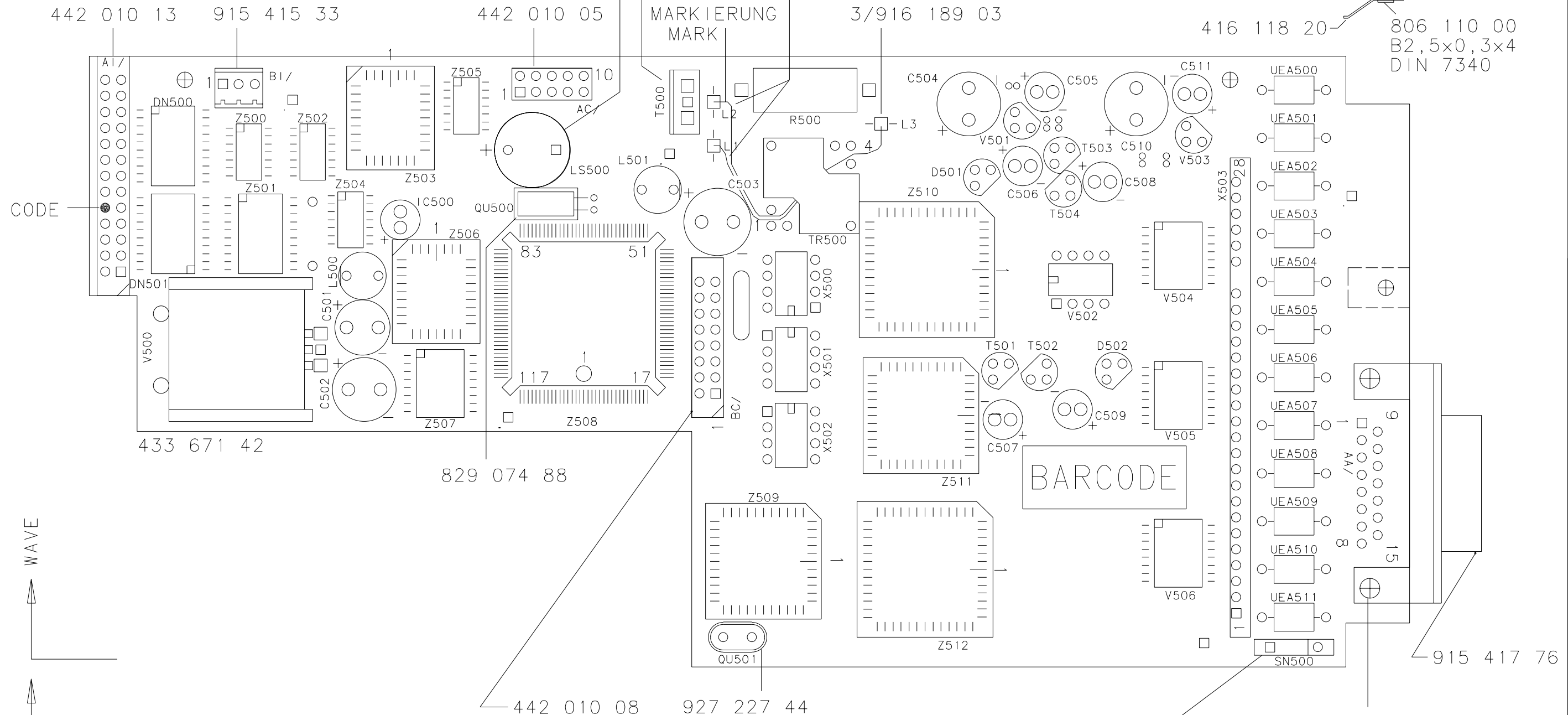
THIS WIRE IS 4MM LONGER
DIESER ANSCHLUSS IST 4mm LAENGER

MARKIERUNG
MARK

3/916 189 03

416 118 20

806 110 00
B2,5x0,3x4
DIN 7340



WAVE

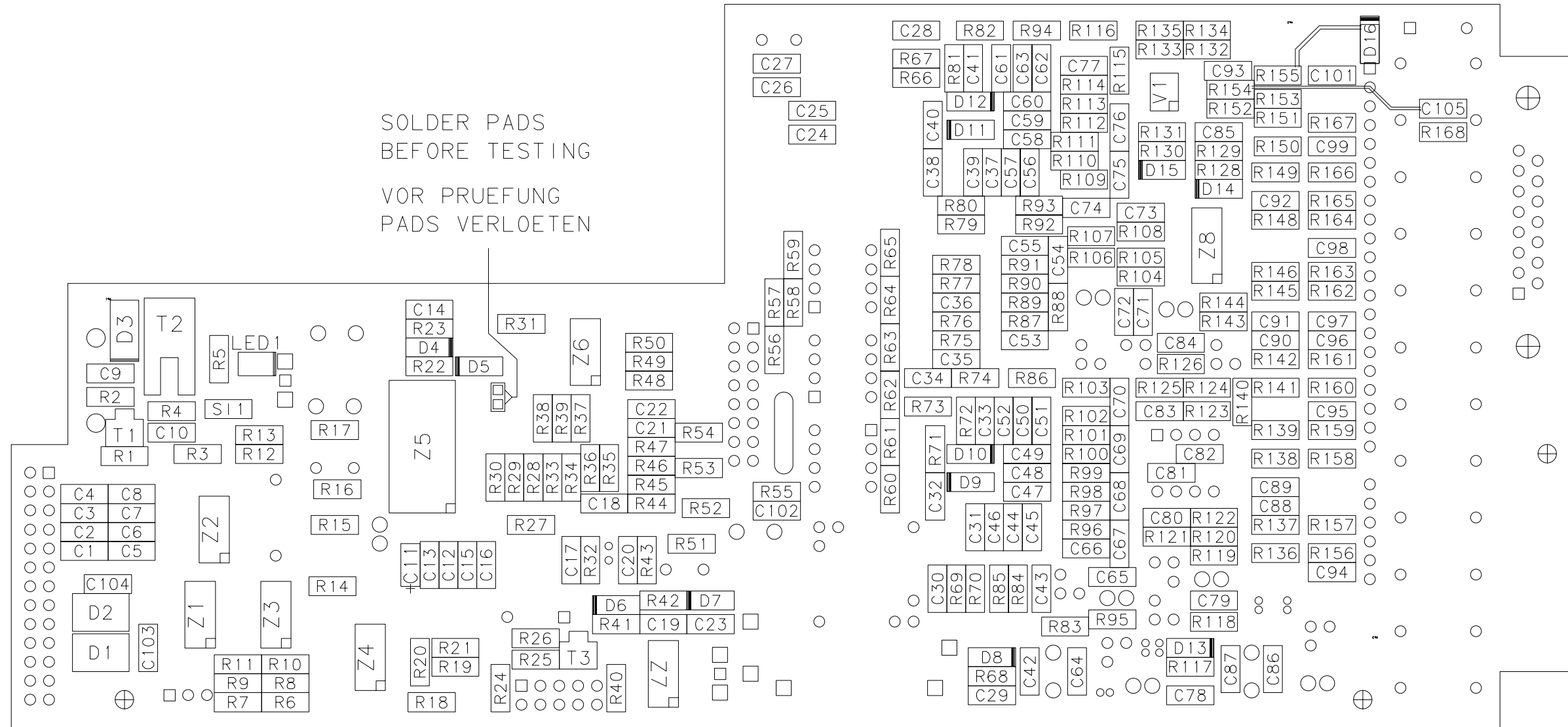
REFLOW

SOLDER SWITCH
AFTER TESTING
NACH PRUEFUNG
SCHALTER VERLOETEN

2/806 130 68
RIVSCREW 3,5 x 7,0
HEAD ON HOUSING
KOPF AUF GEHAEUSE

| | | | | | |
|---|-------|--------------|----------|---------------|-------------------|
| Marquette Hellige GmbH D-79007 Freiburg | | | | 2002899-002 | 1 / 2 |
| REVISIONS | | | | A03 | REF DWG CORINA |
| Revision-No | Index | Date/Name | | 43367142 | |
| MR23703 | A | 16.03.00/MSG | | Date/Name | |
| | | | Drawn | 16.03.00/MSG | |
| | | | Approved | 16.03.00/WMW | |
| | | | | | |
| | | | Issued | WALTERSBERGER | |

GLUING
↑



433 671 42

| | | | | | | | |
|---|-------|--------------|----------|---------------|--|-------------------|--|
| Marquette Hellige GmbH D-79007 Freiburg | | | | 2002899-003 | | 2 / 2 | |
| REVISIONS | | | | A03 | | REF DWG CORINA | |
| Revision-No | Index | Date/Name | | 43367142 | | | |
| MR23703 | A | 16.03.00/MSG | | Date/Name | | | |
| | | | Drawn | 16.03.00/MSG | | | |
| | | | Approved | 16.03.00/WMW | | | |
| | | | Issued | WALTERSBERGER | | | |

BEND T500 ~20 DEGREES TO THE RIGHT AND OVERSHRINK IT WITH 90115917 (22MM LONG)
T500 NACH RECHTS UM CA. 20 GRAD ABBIEGEN UND MIT 90115917 (22 MM LANG) UEBERSCHRUMPFEN

POSITION PRINTING DOES NOT FIT TO COMPONENT
WEISSDRUCK ENTSPRICHT NICHT DEM BAUTEIL

REMOVE COVER AFTER SOLDERING
ABDECKUNG NACH LOETPROZESS
ENTFERNEN |

2 FIXATIONS WITH SEALING GLUE 929 073 00
2X FIXIERT MIT DICHUNGSKLEBER 929 073 00

THIS WIRE IS 4 MM LONGER
DIESER ANSCHLUSS IST 4 MM LAENGER

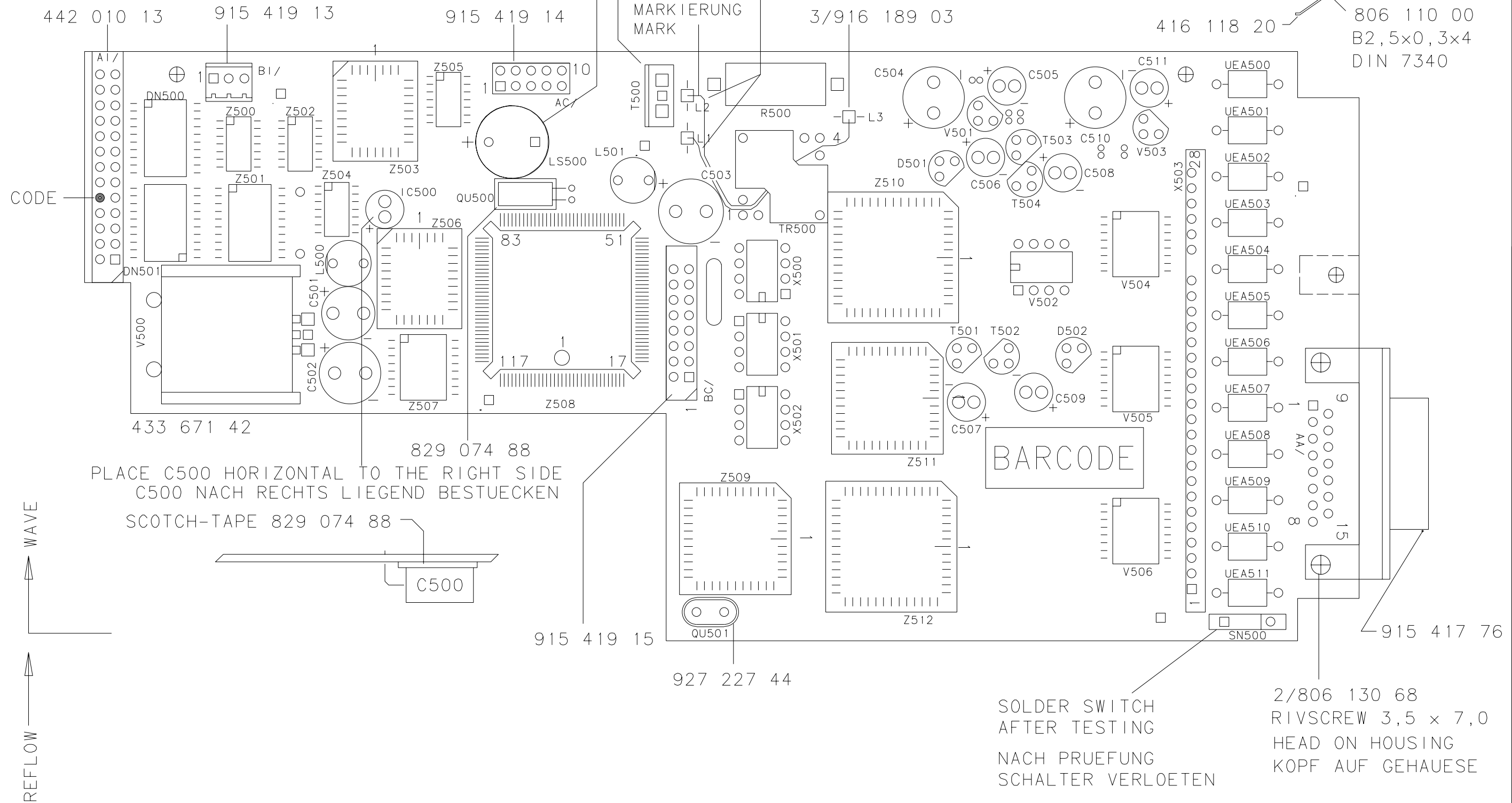
MARKIERUNG
MARK |

3/9,16 189 03

804 177 06
2,7 DIN 125

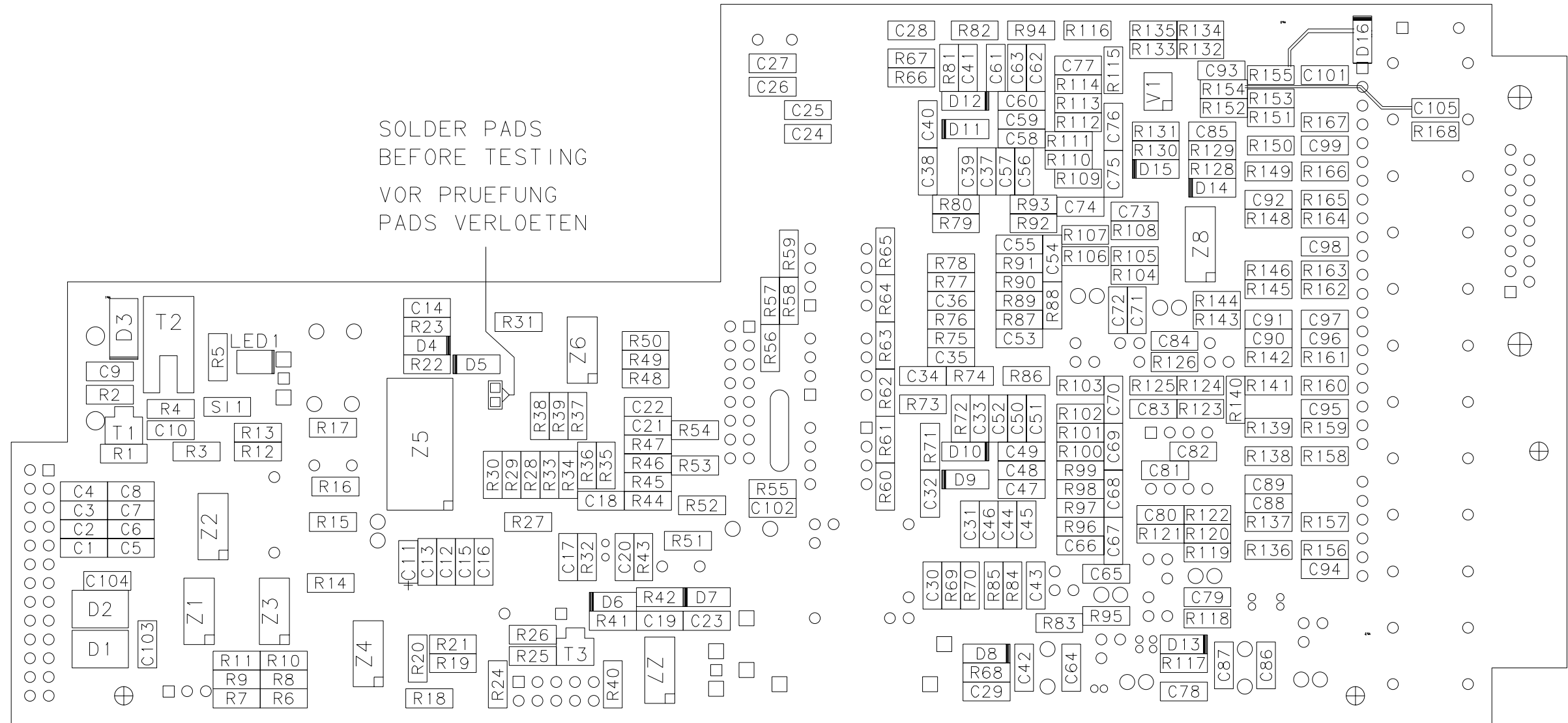
416 118 20 -

806 110 00
B2, 5x0, 3x4
DIN 7340



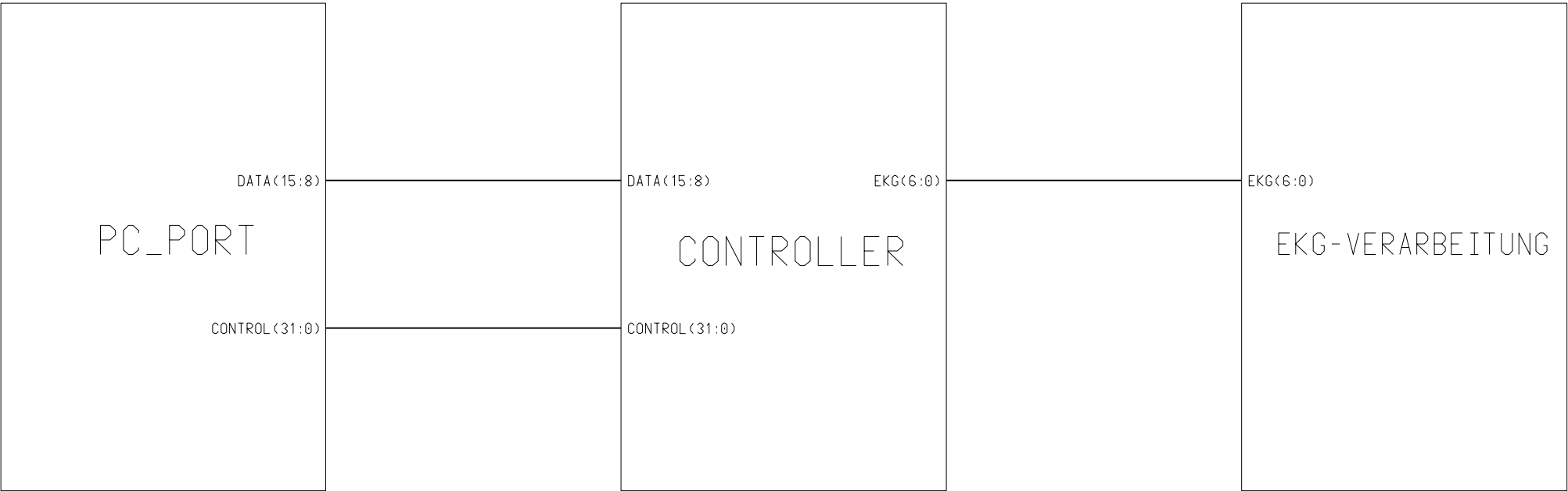
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| Marquette Hellige GmbH D-79007 Freiburg | | | 2003219-002 | 1 / 2 |
| REVISIONS | | | A03 | REF DWG |
| Revision-No | Index | Date/Name | 43367142 | |
| MR23703 | A | 16.03.00/MSG | Date/Name | |
| | | | 16.03.00/MSG | |
| | | | 16.03.00/WWW | |
| | | Drawn | 16.03.00/MSG | CORINA ANALOG-EKG-VERS. |
| | | Approved | 16.03.00/WWW | |
| | | Issued | WAI TERSRECFER | |

GLUING
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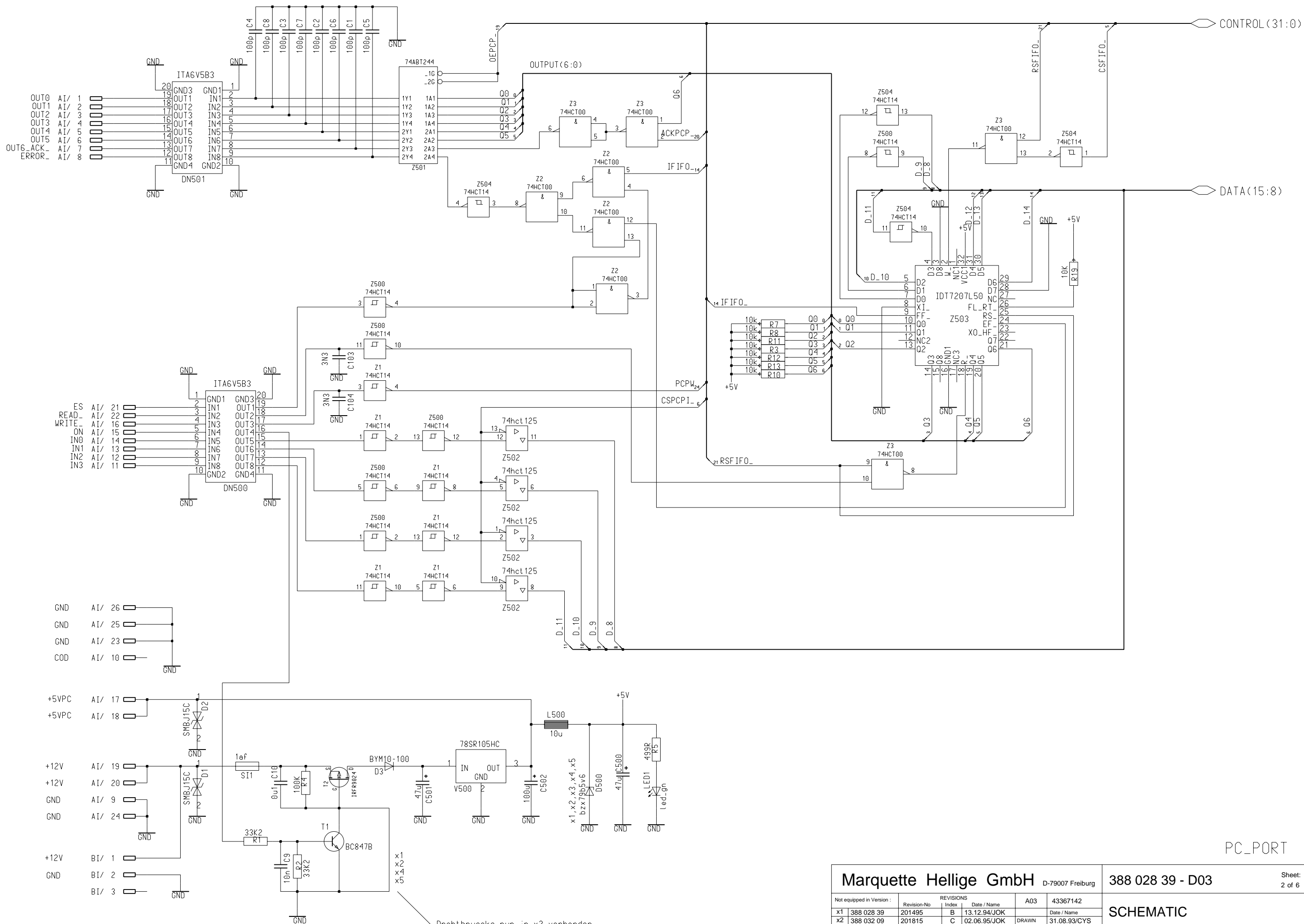


433 671 42

| | | | | | | | |
|---|-------|--------------|----------|---------------|--|-------------------------|--|
| Marquette Hellige GmbH D-79007 Freiburg | | | | 2003219-003 | | 2 / 2 | |
| REVISIONS | | | | A03 | | REF DWG | |
| Revision-No | Index | Date/Name | | 43367142 | | | |
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| | | | Drawn | 16.03.00/MSG | | | |
| | | | Approved | 16.03.00/WMW | | | |
| | | | Issued | WALTERSBERGER | | | |



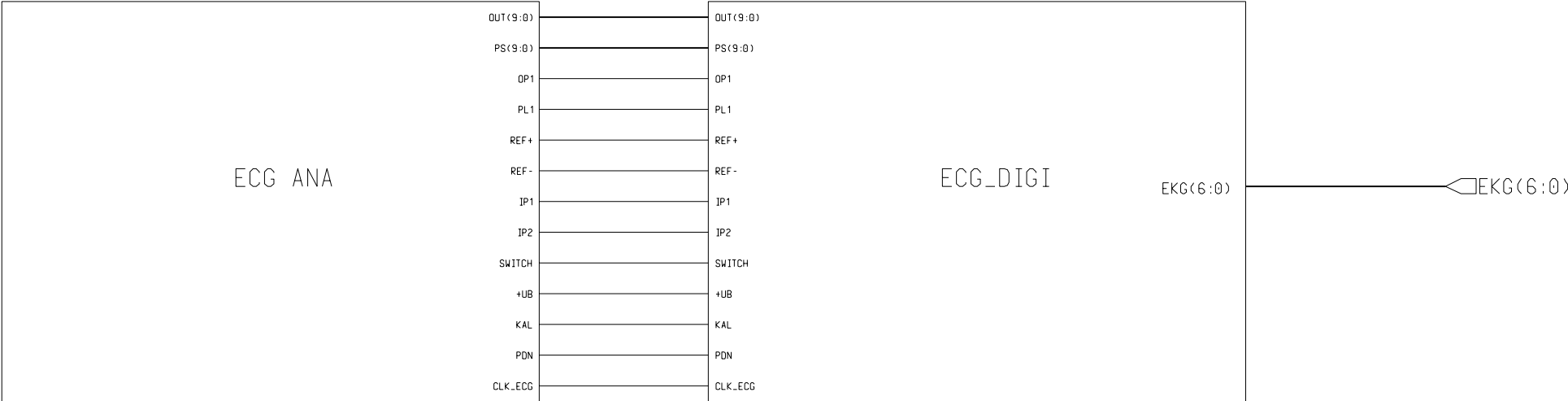
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| Marquette Hellige GmbH | | | | | | D-79007 Freiburg | 388 028 39 - D02 | Sheet: 1 of 6 |
| Not equipped in Version : | | REVISIONS | | | A03 | 43367142 | SCHEMATIC CORINA | |
| x1 | 388 028 39 | 202698 | A | 27.01.97/MSG | | Date / Name | | |
| x2 | 388 032 09 | 063340 | B | 14.03.00/MSG | DRAWN | 31.08.93/CYS | | |
| x3 | 388 032 35 | | | | APPROVED | 31.08.93/CYS | | |
| x4 | 2002899-001 | | | | | | | |
| x5 | 2003219-001 | | | | ISSUED | SPITZNAGEL | | |



| Marquette Hellige GmbH | | | | | | D-79007 Freiburg | | 388 028 39 - D03 | | Sheet: 2 of 6 | |
|---------------------------|-------------|-------------|---|--------------|----------|------------------|--|------------------|--|---------------|--|
| Not equipped in Version : | | Revision-No | | Index | | Date / Name | | A03 | | 43367142 | |
| x1 | 388 028 39 | 201495 | B | 13.12.94/JOK | | | | | | Date / Name | |
| x2 | 388 032 09 | 201815 | C | 02.06.95/JOK | DRAWN | | | | | 31.08.93/CYS | |
| x3 | 388 032 35 | 202698 | D | 27.01.97/MSG | APPROVED | | | | | 31.08.93/CYS | |
| x4 | 2002899-001 | 203259 | E | 27.02.98/MSG | | | | | | | |
| x5 | 2003219-001 | 063340 | F | 14.03.00/MSG | ISSUED | | | | | SPITZNAGEL | |

PC_PORT

SCHEMATIC
CORINA



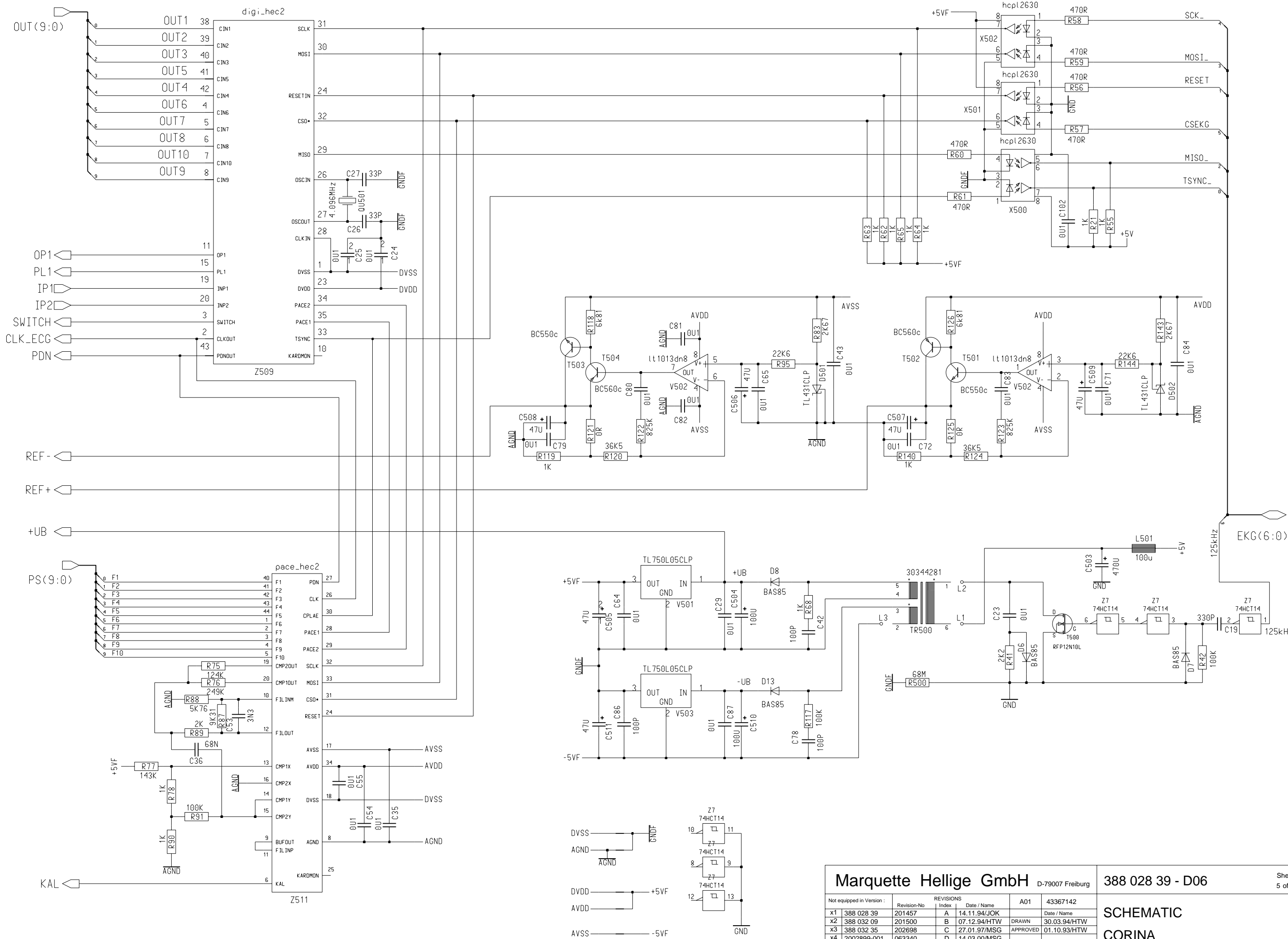
Marquette Hellige GmbH D-79007 Freiburg

388 028 39 - D05

Sheet:
4 of 6

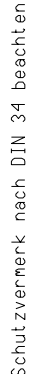
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| x5 | 2003219-001 | | | | ISSUED | | SPITZNAGEL |

SCHEMATIC
CORINA

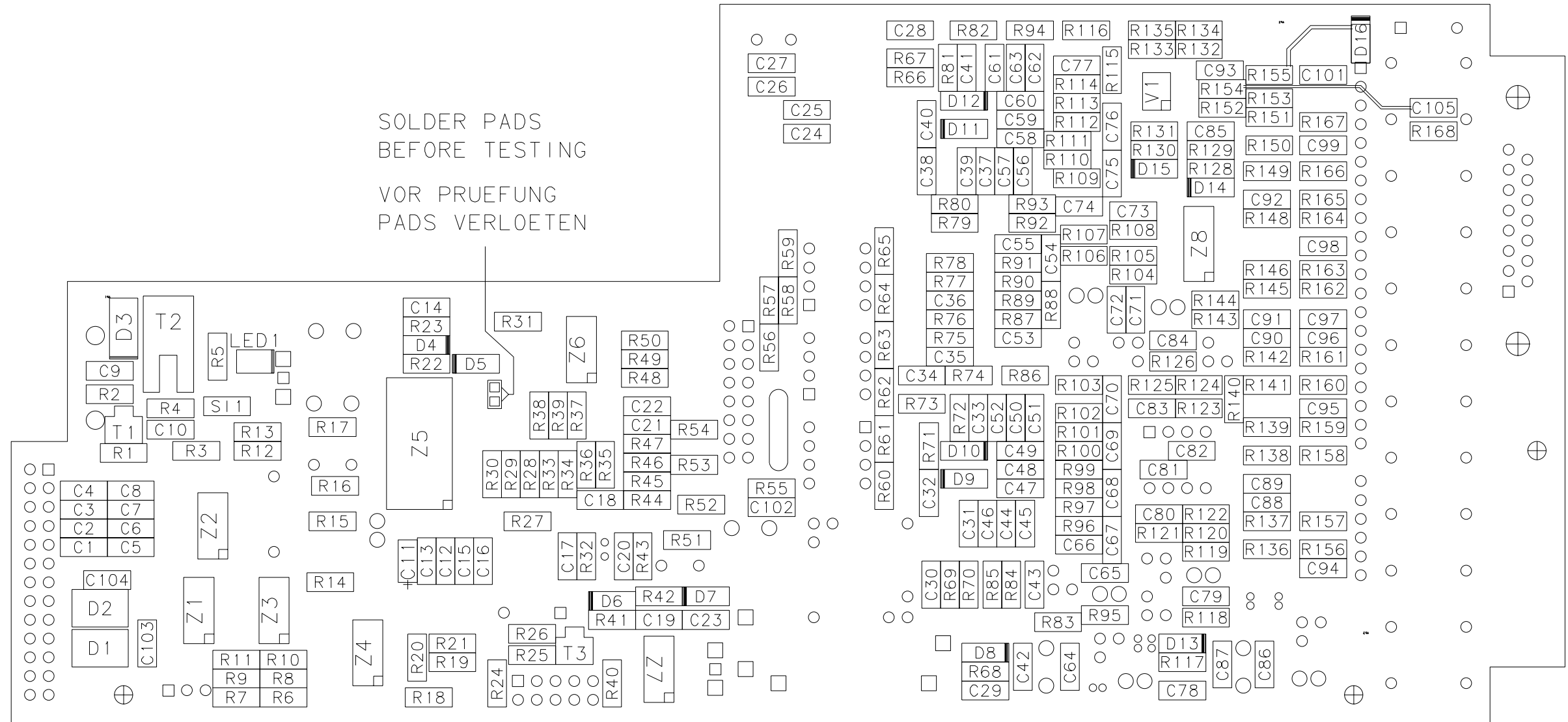


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| x2 | 388 032 09 | 201500 | B | 07.12.94/HTW | DRAWN | 30.03.94/HTW |
| x3 | 388 032 35 | 202698 | C | 27.01.97/MSG | APPROVED | 01.10.93/HTW |
| x4 | 2002899-001 | 063340 | D | 14.03.00/MSG | | |
| x5 | 2003219-001 | | | | ISSUED | WEBER |

SCHEMATIC
CORINA

DATE
DIR

GLUING
↑



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| | | | | | | | |
|---|-------|--------------|----------|--------------|--|-------------------|--|
| Marquette Hellige GmbH D-79007 Freiburg | | | | 38802839-D09 | | 2 / 2 | |
| REVISIONS | | | | A03 | | REF DWG CORINA | |
| Revision-No | Index | Date/Name | | 43367142 | | | |
| 201500 | B | 14.12.94/JOK | | Date/Name | | | |
| 201815 | C | 02.06.95/JOK | Drawn | 20.04.94/JOK | | | |
| 202499 | D | 11.09.96/MSG | Approved | 31.08.94/JOK | | | |
| 203259 | E | 27.02.98/MSG | | | | | |
| 063340 | F | 15.03.00/MSG | Issued | SPITZNAGEL | | | |

BTAS = 300
BTBS = 84
LOET = 1536

BEND T500 ~20 DEGREES TO THE RIGHT AND OVERSHRINK IT WITH 90115917 (22MM LONG)
T500 NACH RECHTS UM CA. 20 GRAD ABBIEGEN UND MIT 90115917 (22 MM LANG) UEBERSCHRUMPFEN

POSITION PRINTING DOES NOT FIT TO COMPONENT
WEISSDRUCK ENTSPRICHT NICHT DEM BAUTEIL
REMOVE COVER AFTER SOLDERING
ABDECKUNG NACH LOETPROZESS
ENTFERNEN

2 FIXATIONS WITH SEALING GLUE 929 073 00
2X FIXIERT MIT DICHTUNGSKLEBER 929 073 00

THIS WIRE IS 4 MM LONGER
DIESER ANSCHLUSS IST 4 MM LAENGER

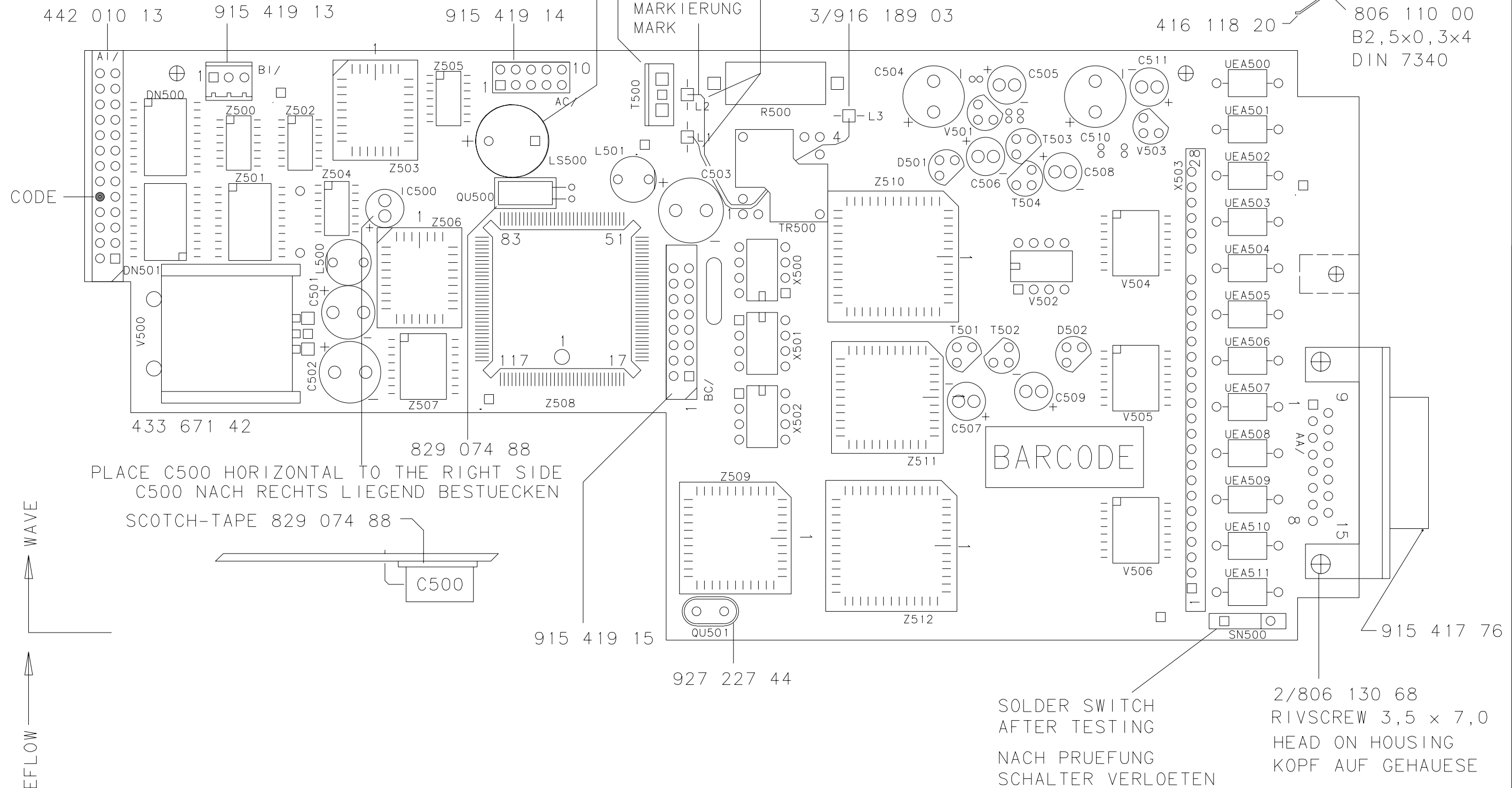
MARKIERUNG
MARK

3/916 189 03

804 177 06
2,7 DIN 125

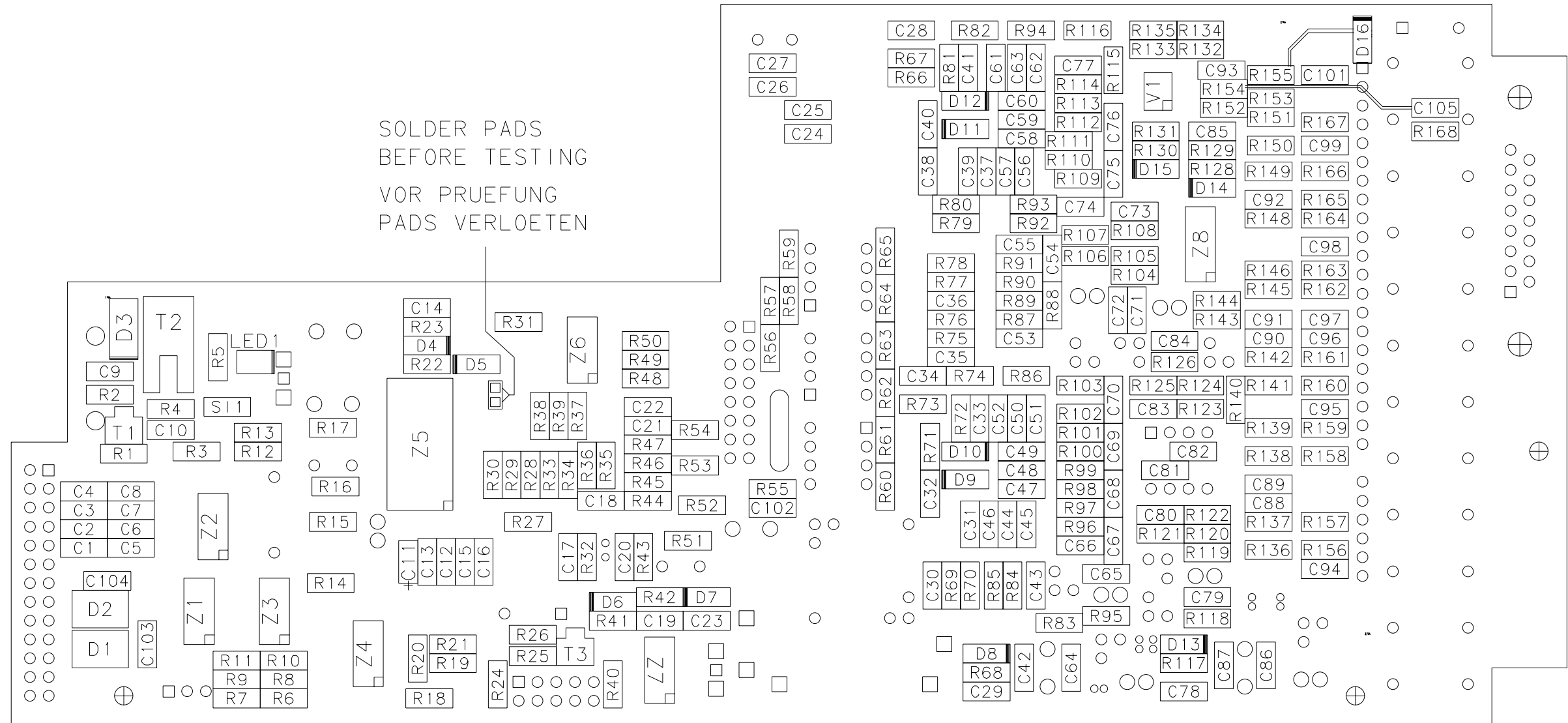
416 118 20

806 110 00
B2,5x0,3x4
DIN 7340



| | | | | | | | |
|---|--|-------|--|--------------|--|-------------------------|--|
| Marquette Hellige GmbH D-79007 Freiburg | | | | 38803209-D09 | | 1 / 2 | |
| REVISIONS | | | | | | A03 | |
| Revision-No | | Index | | Date/Name | | 43367142 | |
| 202637 | | A | | 20.01.97/MSG | | REF DWG | |
| 063340 | | B | | 15.03.00/MSG | | 26.07.96/JOK | |
| | | | | Drawn | | 26.07.96/JOK | |
| | | | | Approved | | 26.07.96/JOK | |
| | | | | Issued | | CORINA ANALOG-EKG-VERS. | |
| | | | | WALTERSB. | | | |

GLUING
↑



433 671 42

| | | | | | |
|---|-------|--------------|----------|--------------|--|
| Marquette Hellige GmbH D-79007 Freiburg | | | | 38803209-D10 | 2 / 2 |
| REVISIONS | | | | A03 | REF DWG CORINA ANALOG-EKG-VERS. |
| Revision-No | Index | Date/Name | | 43367142 | |
| 202499 | A | 11.09.96/MSG | | Date/Name | |
| 203259 | B | 27.02.98/MSG | Drawn | 26.07.96/JOK | |
| 063340 | C | 15.03.00/MSG | Approved | 26.07.96/JOK | |
| | | | Issued | WAI TRSR | |
| | | | | | |

BTAS = 300
BTBS = 84
LOET = 1536

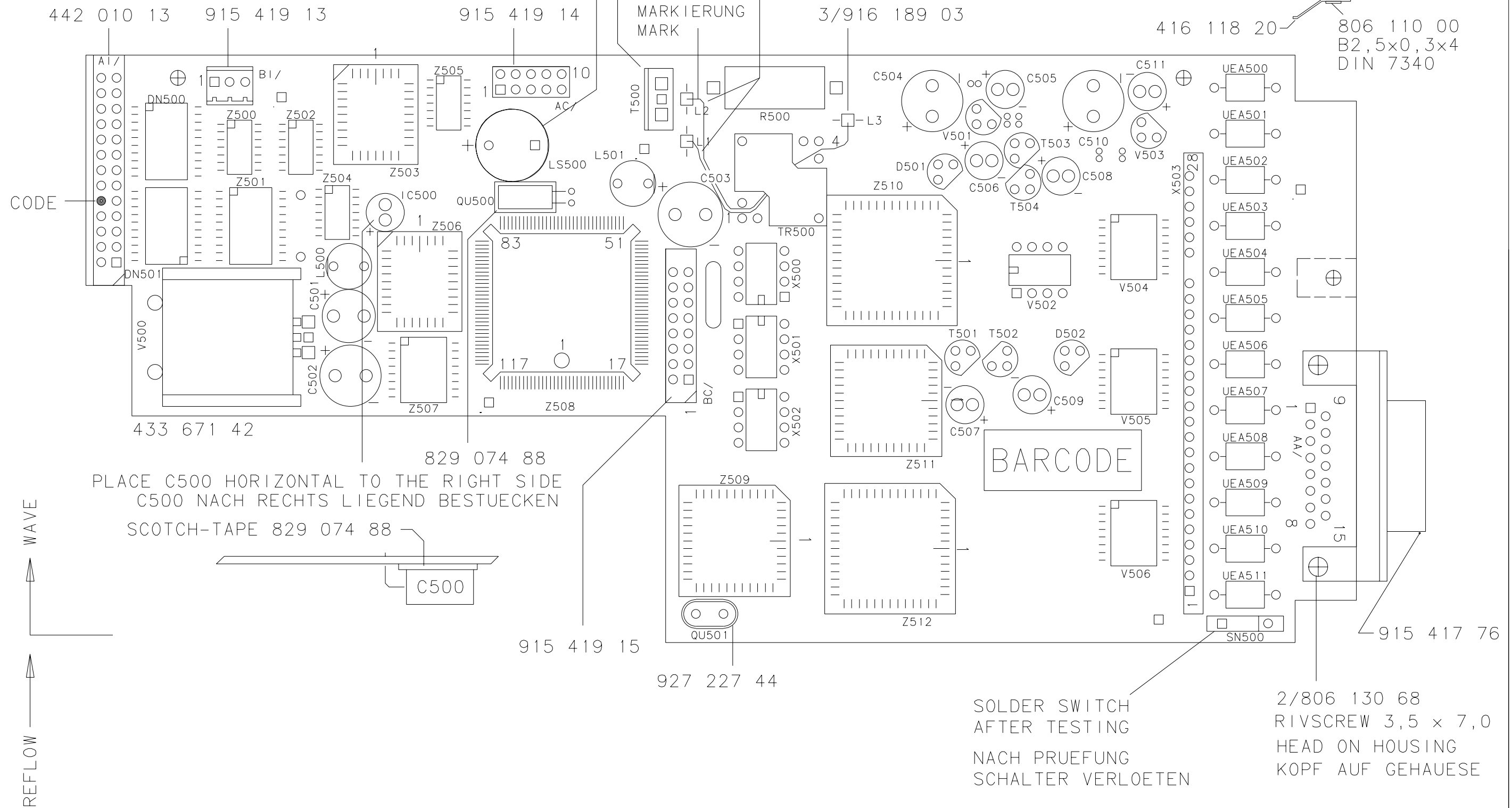
BEND T500 ~20 DEGREES TO THE RIGHT AND OVERSHRINK IT WITH 90115917 (22MM LONG)
T500 NACH RECHTS UM CA. 20 GRAD ABBIEGEN UND MIT 90115917 (22 MM LANG) UEBERSCHRUMPFEN

POSITION PRINTING DOES NOT FIT TO COMPONENT
WEISSDRUCK ENTSPRICHT NICHT DEM BAUTEIL
REMOVE COVER AFTER SOLDERING
ABDECKUNG NACH LOETPROZESS
ENTFERNEN

2 FIXATIONS WITH SEALING GLUE 929 073 00
2X FIXIERT MIT DICHTUNGSKLEBER 929 073 00
THIS WIRE IS 4 MM LONGER
DIESER ANSCHLUSS IST 4 MM LAENGER

804 177 06
2,7 DIN 125

416 118 20
806 110 00
B2,5x0,3x4
DIN 7340

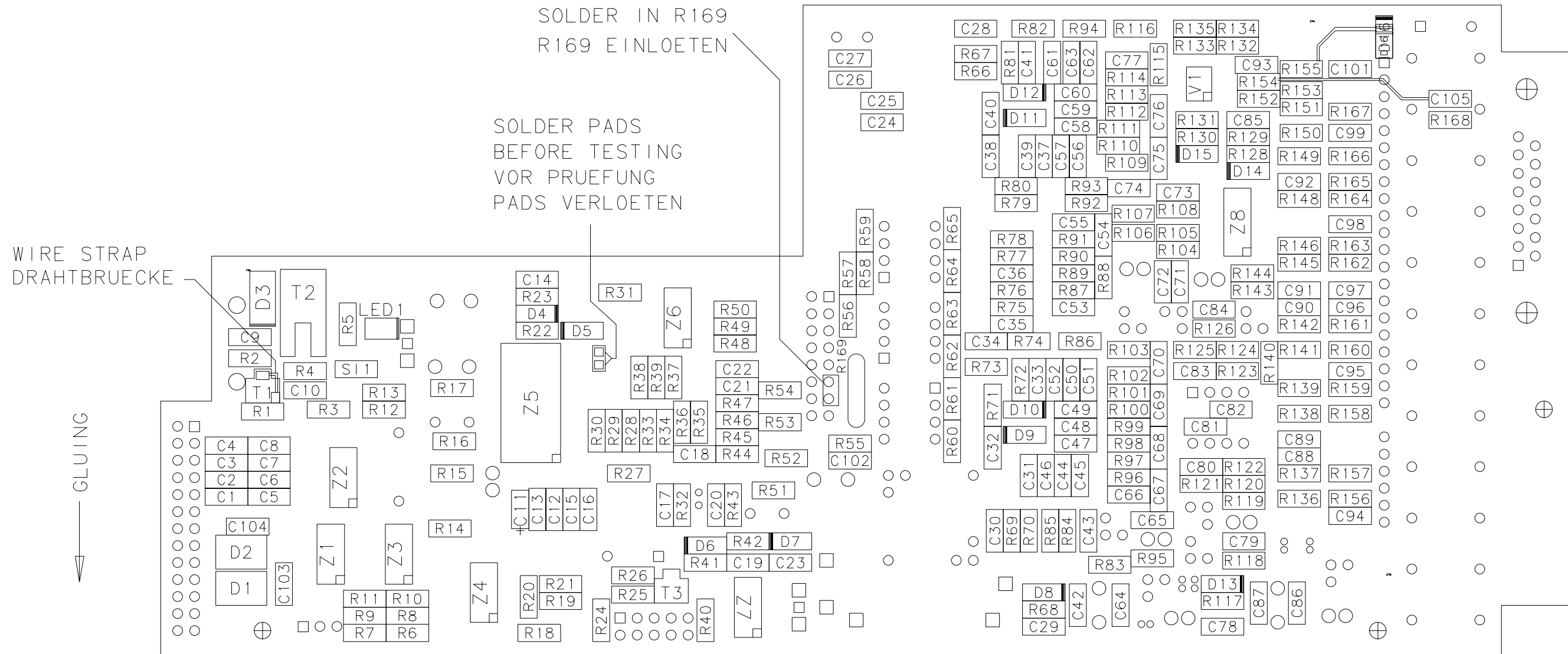


SOLDER SWITCH
AFTER TESTING
NACH PRUEFUNG
SCHALTER VERLOETEN

2/806 130 68
RIVSCREW 3,5 x 7,0
HEAD ON HOUSING
KOPF AUF GEHAUSE

| | | | | | |
|---|-------|--------------|--|--------------|--------------|
| Marquette Hellige GmbH D-79007 Freiburg | | | | 38803235-D09 | 1 / 2 |
| REVISIONS | | | | A03 | 43367142 |
| Revision-No | Index | Date/Name | | Drawn | 09.12.96/MSG |
| 063340 | A | 16.03.00/MSG | | Approved | 09.12.96/MSG |
| | | | | Issued | SCHULER |

REF DWG
CORINA STANDALONE



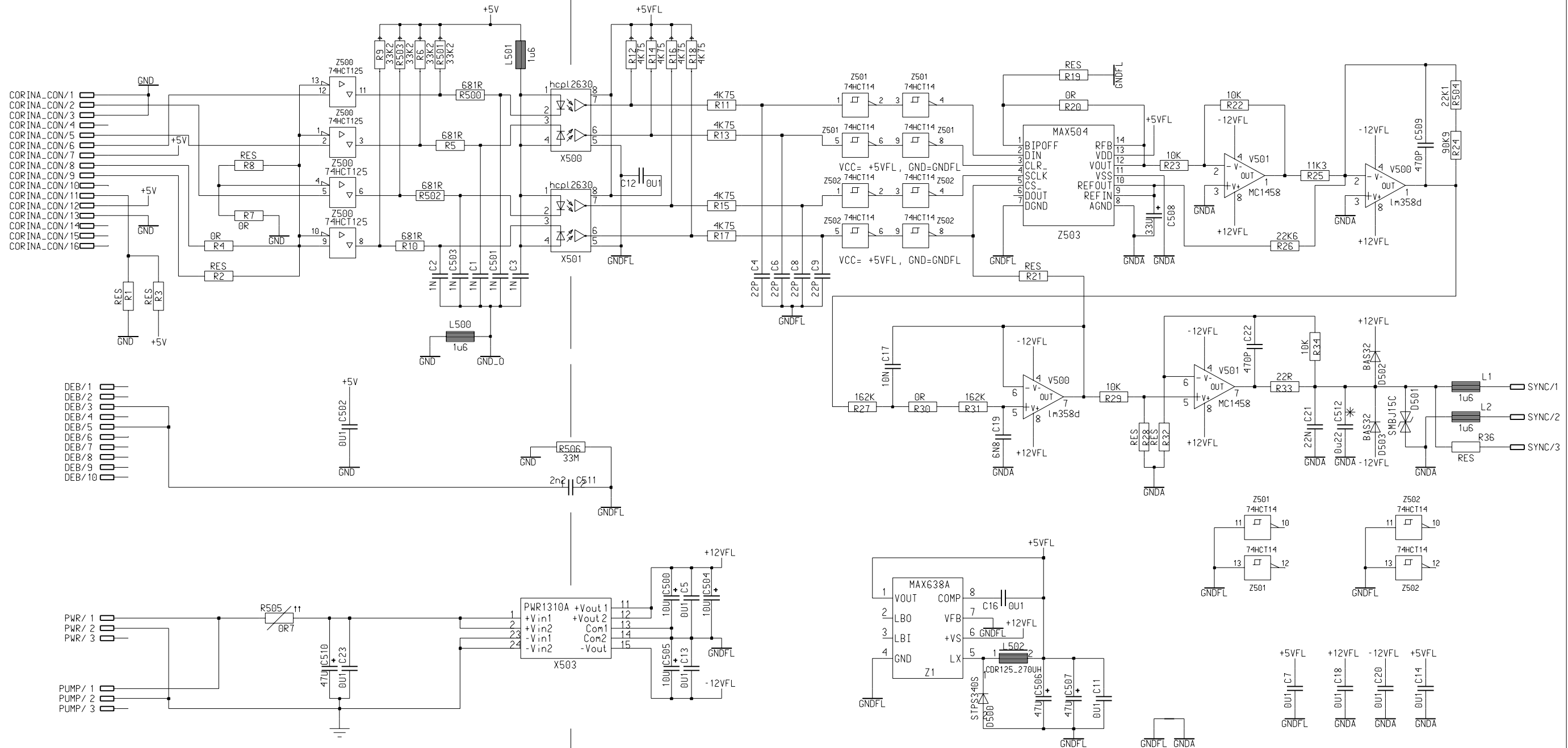
433 671 42

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|---|-------|--------------|--|--------------|--|--------------|--|
| Marquette Hellige GmbH D-79007 Freiburg | | | | 38803235-D10 | | 2 / 2 | |
| REVISIONS | | | | A03 | | 43367142 | |
| Revision-No | Index | Date/Name | | Date/Name | | Date/Name | |
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| | | | | Drawn | | | |
| | | | | Approved | | | |
| | | | | Issued | | SCHULER | |

REF DWG
CORINA STANDALONE

NON-FLOATING

FLOATING



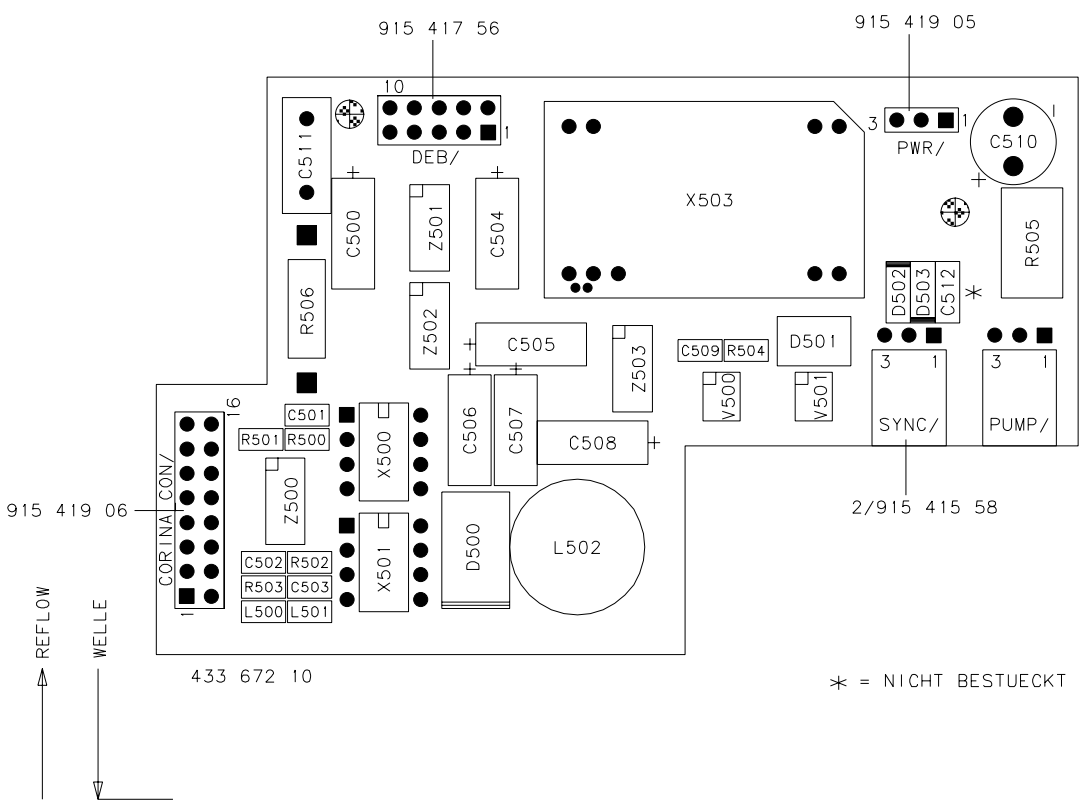
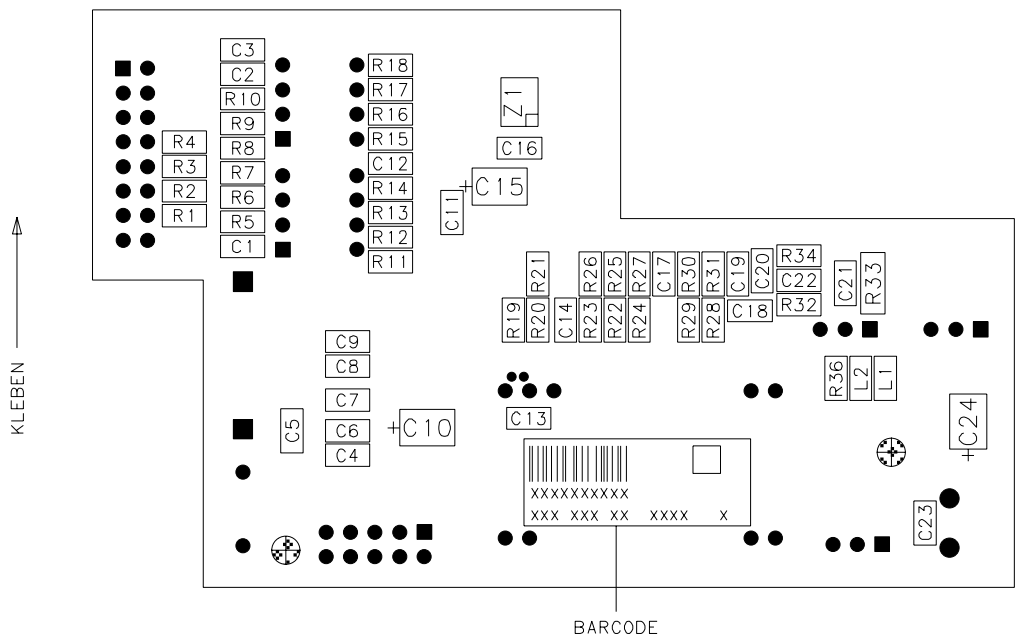
* = NICHT BESTUECKT

Abstandshalter

2u2 IC24
2u2 IC15
2u2 IC10

| HELLIGE GMBH | | | | Postfach 728 D-79007 Freiburg | | 388 032 02 P | |
|--------------|-------|--------------|--|----------------------------------|---------------|---|--|
| ÄNDERUNGEN | | | | A03 | F67210 | LPL. CORINA TRIGGER PCB CORINA TRIGGER | |
| Änd.-Nr. | Index | Datum/Name | | | Datum/Name | | |
| ----- | A | 30.08.96/MMW | | | 12.07.96/MMW | | |
| | | | | gez. | 12.07.96/MMW | | |
| | | | | gepr. | | | |
| | | | | Entw. | Waltersberger | | |

BT-AS = 65
BT-BS = 42
LOET-AS = 197
LOET-BS = 121



Schutzvermerk nach DIN 34 beachten.

| | | | | | |
|--------------|-----|--------------|--------|----------------------------------|--|
| HELLIGE GMBH | | | | Postfach 728 D-79007 Freiburg | 388 032 02 R |
| ÄNDERUNGEN | | | | | |
| ANTR. V | IND | DATE /NAME | M1.5:1 | A04 F67210 | LPL.CORINA TRIGGER PCB CORINA TRIGGER |
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| --- | B | 30.08.96/JOK | GEZ | 23.04.96/JOK | |
| --- | | | GEPR. | 23.04.96/JOK | |
| --- | | | GEPR. | | |
| | | | | ENTW. WALTERSB. | |



marquette

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Fax +49 761 45 43 - 233

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26/F, Catic Plaza
8 Causeway Road
Causeway Bay
Hong Kong
Tel. +852 2804 2320
Fax +852 2804 1776